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THE LARYNGOSCOPE

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EAR - NOSE - THROAT

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THE
LARYNGOSCOPE.

VOL. XXXVI SEPTEMBER, 1926 No. 9

ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding that they are contributed exclusively to THE LARYNGOSCOPE.)

PARACUSIS.

DR. VERN O. KNUDSEN and DR. ISAAC H. JONES,
Los Angeles.

It is a common observation that many people appear to hear better in the presence of a noise. This phenomenon, usually termed "paracusis," has not only been noted by otologists, but also by patients themselves and the individuals with whom they converse. Frequently certain patients with impaired hearing will ask why it is that they can hear so well while traveling on a railroad train or a street car, or riding in an automobile.

This subject, therefore, is of interest to the clinician and, in fact, has been a subject of controversy for over one hundred and fifty years. The clinician is concerned to know the significance of this phenomenon in diagnosis and prognosis. Even more important, however, is the bearing that this phenomenon has upon the general problem of hearing. A complete understanding of paracusis might lead to a better conception of the physiology of the cochlea. Many of the phenomena of hearing and deafness have been satisfactorily explained, but paracusis has appeared to most of us to hold a certain element of mystery.

Whereas the word "paracusis" would literally indicate a perversion of the hearing function, custom has limited the meaning of the term to the phenomenon of hearing better in the presence of a noise. Credit for the first description of this phenomenon is attributed to Willis, and therefore we are accustomed, when we think of paracusis, to signify "Paracusis Willisii." The term para-

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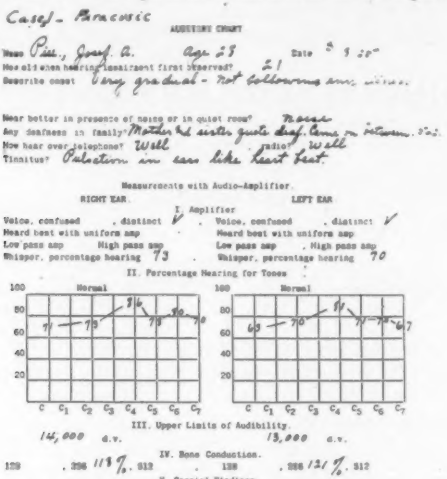
cusi Willisii, therefore, is generally used to signify that certain individuals hear better in the presence of a noise than they do in the quiet.

The existence of paracusis as a real phenomenon—that is, that certain individuals actually do hear better in the presence of a noise—has been rather generally accepted by otologists and others. The general attitude has been to accept the statements of such patients at their full value. The positive conviction of the patient himself


Case 1 - Paracusis

AUDITORY CHART

Name Pitt., Josef. A. Age 23 Date 8 9 20

How old when hearing impairment first observed? 21

Describe onset Very gradual - Not following any illness.

Hear better in presence of noise or in quiet room? Noise

Any deafness in family? Mother & sister quite deaf. Came on between 30-40.

How hear over telephone? Well radio Well

Tinnitus? Palsatum in ears like heart beat.

Measurements with Audio-Amplifier.

RIGHT EAR		LEFT EAR	
I. Amplifier			
Voice, confused . distinct ✓		Voice, confused . distinct ✓	
Heard best with uniform amp		Heard best with uniform amp	
Low pass amp	High pass amp	Low pass amp	High pass amp
Whisper, percentage hearing 73		Whisper, percentage hearing 70	

II. Percentage Hearing for Tones

100	Normal							100	Normal						
80				84		80		80				84			
60	71		73		78		70	60	63		70		71	70	67
40								40							
20								20							
	C	C_1	C_2	C_3	C_4	C_5	C_6 C_7		C	C_1	C_2	C_3	C_4	C_5	C_6 C_7

III. Upper Limits of Audibility.

14,000 d.v. 13,000 d.v.

IV. Bone Conduction.

128 . 256 11? . 512 128 . 256 12? . 512

V. Special Findings

(Pitch and loudness of tinnitus, displacusis, tonal islands, etc.)

95 % Tragus, right. 95 % Tragus, left - as contrasted with 12% by bone conduction and 70 % air conduction.

Diagnosis: Otosclerosis.

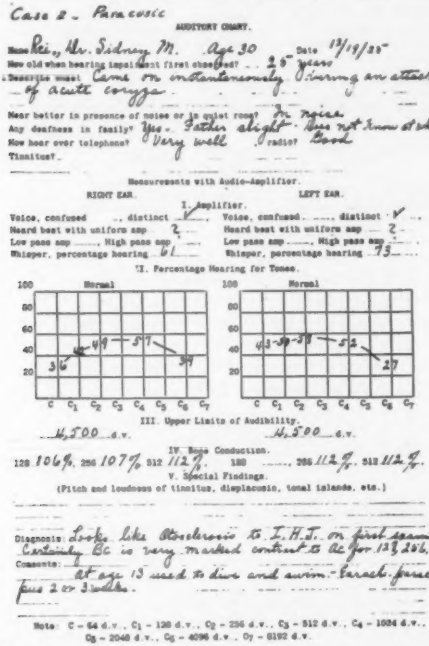
Comments

Note C - 64 d.v., C_1 - 128 d.v., C_2 - 256 d.v., C_3 - 512 d.v., C_4 - 1024 d.v., C_5 - 2048 d.v., C_6 - 4096 d.v., C_7 - 8192 d.v.

Fig. 1. Note the features characteristic of otosclerosis: Ages of onset; the gradual development of the hearing defect; deafness in the family, which occurred at the characteristic age; distinct hearing with the amplified voice, showing good cochlear function for the range of the voice; the best hearing for tones is in the middle range; marked increased bone-conduction.

has perhaps been the main reason for the general acceptance of the idea. The usual explanation has been that the noise started the ossicles into gross vibration, thus enabling them to transmit the lesser vibrations which they otherwise could not transmit. Recently the question has been raised as to whether these "paracusics" actually do hear better in a noise. It occurred to the writers that the answer to this question could be determined by experimental work. This paper presents the results of such experiments.

Of the total number of those hard-of-hearing, a not inconsiderable portion speak of their ability to hear better in the presence of a noise. In a recent series of one hundred and eighty-seven consecutive clinical records made with the Audio-Amplifier,* we find the following classification: Purely perceptive, seventy-three cases; mixed perceptive and conductive impairment, fifty-eight cases; purely conductive, or almost entirely conductive impairment, fifty-six cases. Of the seventy-three perceptive cases, no case exhibited paracusis. Of the fifty-eight mixed perceptive and conductive cases,


Case 2 - Paracusic

AUDITORY CHART.

Name Rev. Mr. Sidney M. Age 30 Date 12/19/25

How old when hearing impairment first observed? .. 25 years

Describe onset Came on intermittently during an attack of acute coryza.

Hear better in presence of noise or in quiet room? In noise.

Any deafness in family? Yes. Father slight. Does not know about a

How hear over telephone? Very well radio? Good

Tinnitus?.

Measurements with Audio-Amplifier.

RIGHT EAR. LEFT EAR.

I. Amplifier.

Voice, confused .., distinct ✓ Voice, confused ....., distinct ✓

Heard best with uniform amp 2 Heard best with uniform amp 2

Low pass amp ....., High pass amp ..... Low pass amp ....., High pass amp .....

Whisper, percentage hearing 61 Whisper, percentage hearing 73

II. Percentage Hearing for Tones.

100 Normal 100 Normal

80 80

60 60

40 49 — 57 40 43 — 39 — 52

20 36 39 20 27

C C_1 C_2 C_3 C_4 C_5 C_6 C_7 C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility.

4,500 d.v. 4,500 d.v.

IV. Bone Conduction.

128 106% 256 107% 512 112% 128 ..... 256 112% 512 112%

V. Special Findings.

(Pitch and loudness of tinnitus, diplacusis, tonal islands, etc.)

Diagnosis: Looks like Otosclerosis to I.H.T. on first examination. Certainly Bc is very marked contrast to Ac for 128, 256, 512.

Comments:

At age 15 used to dive and swim. Earach. Perforation five 2 or 3 weeks.

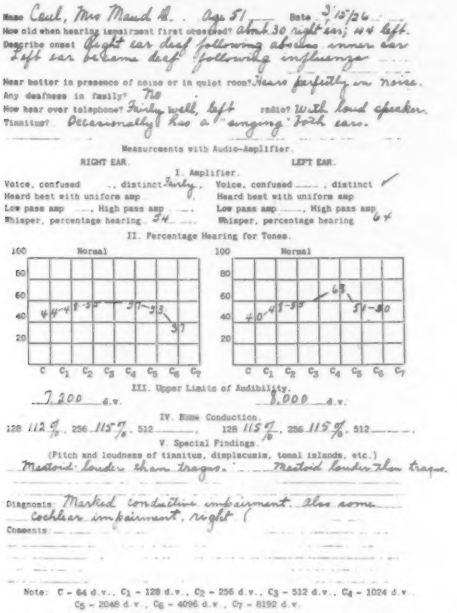
Note: C - 64 d.v., C_1 - 128 d.v., C_2 - 256 d.v., C_3 - 512 d.v., C_4 - 1024 d.v., C_5 - 2048 d.v., C_6 - 4096 d.v., C_7 - 8192 d.v.

Fig. 2. Otosclerosis is suggested by the age of onset; good hearing for the amplified voice; best hearing for the middle register; and increased bone-conduction.

fifteen exhibited paracusis, or about 25 per cent. Of the fifty-six cases of conductive impairment, twenty-six exhibited paracusis, or about 46 per cent. It is to be noted that paracusis appears to be a phenomenon associated with those having conductive impairment.

For simplicity we will speak of the individual with normal hearing as a "normal;" the individual with impaired hearing of the perceptive type as a "perceptive;" and the individual who states that he hears better in a noise than he does in the quiet as a "paracusic."

Of the above series of cases, certain typical ones were selected for special study—ten paracusics and two perceptives. In addition, tests were conducted upon three normals. The data for the three normals are practically identical and, therefore, the data will be given for only one of the three normals. Figs. 1 to 13 are reproductions of the auditory charts of the thirteen patients reported in this paper: Figs. 1 to 10 are for the ten paracusics and will be referred to as Cases 1 to 10, respectively; Figs. 11 and 12 are for


Case 3 - Paracusic

AUDITORY CHART.

Name Caul, Mrs Maud R. Age 51 Date 3/15/26.
How old when hearing impairment first observed? about 30 right ear; 44 left.
Describe onset Right ear deaf following abscess inner ear
Left ear became deaf following influenza
Hear better in presence of noise or in quiet room? Hears perfectly in noise.
Any deafness in family? No
How hear over telephone? Fairly well, left radio? With loud speaker.
Tinnitus? Occasionally. Has a singing both ears.

Measurements with Audio-Amplifier.

RIGHT EAR. LEFT EAR.

I. Amplifier.

Voice, confused .., distinct fairly. Voice, confused ..., distinct ✓
Heard best with uniform amp Heard best with uniform amp
Low pass amp ..., High pass amp ... Low pass amp ..., High pass amp
Whisper, percentage hearing 34 Whisper, percentage hearing 64

II. Percentage Hearing for Tones.

III. Upper Limits of Audibility.

7,200 d.v. 8,000 d.v.

IV. Bone Conduction.

128 112 % 256 115 % 512 ——, 128 115 % 256 115 % 512 ——.

V. Special Findings.

(Pitch and loudness of tinnitus, diplacusis, tonal islands, etc.)

Mastoid louder than tragus. Mastoid louder than tragus.

Diagnosis Marked conductive impairment. Also some cochlear impairment, right (

Comments

Note: C - 64 d.v., C1 - 128 d.v., C2 - 256 d.v., C3 - 512 d.v., C4 - 1024 d.v. C5 - 2048 d.v., C6 - 4096 d.v., C7 - 8192 d.v.

Fig. 3. Note that the patient claims "hears perfectly in a noise;" experiments showed that this is attributable to the marked degree of her conductive defect.

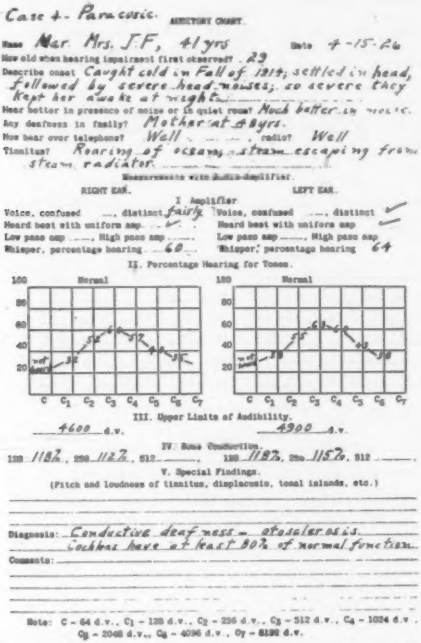
the two perceptives and will be referred to as Case 11 and Case 12; Fig. 13 is for one of the three normals and will be referred to as Case 13. The essential findings of the entire investigation are:

1. A noise decreases the hearing acuity of the individual with normal hearing. This conclusion has been reached through the researches of telephone engineers, and, in fact, is more or less a familiar observation of anyone who has given thought to the subject.
2. A noise decreases the hearing acuity of the perceptive.
3. A noise also decreases the hearing acuity of the paracusic.

In other words, the individual who "hears better in the presence of a noise," actually does not hear so well in the presence of a noise as he does in the quiet.

EXPERIMENTAL STUDIES.

The problem was investigated by two methods of approach: First, determining the effect of noise upon the acuity of hearing of pure tones; second, determining the interfering effect of noise upon the hearing of speech-sounds. This latter method also was employed


Case 4.- Paracusic. AUDITORY CHART.

Name Mar. Mrs. J.F., 41 yrs Date 4-15-24

How old when hearing impairment first observed? 29

Describe onset Caught cold in Fall of 1917, settled in head, followed by severe head noises, so severe they kept her awake at night.

Hear better in presence of noise or in quiet room? Much better in noise.

Any deafness in family? Mother at 80 yrs.

How hear over telephone? Well ... radio? Well

Tinnitus? Roaring of ocean, steam escaping from steam radiator.

Measurements with Audio-Amplifier.

RIGHT EAR. LEFT EAR.

I Amplifier

Voice, confused ..., distinct fairly. Voice, confused ..., distinct ✓

Heard best with uniform amp. ✓ Heard best with uniform amp ✓

Low pass amp ..., High pass amp ... Low pass amp ..., High pass amp

Whisper, percentage hearing 60 Whisper, percentage hearing 64

II. Percentage Hearing for Tones.

III. Upper Limits of Audibility.

4600 d.v. 4900 d.v.

IV. Bone Conduction.

128 1182, 256 1127, 512 ..., 128 1182, 256 1152, 512 ...

V. Special Findings.

(Pitch and loudness of tinnitus, diplacusis, tonal islands, etc.)

Diagnosis: Conductive deafness - otosclerosis. Cochleae have at least 80% of normal function.

Comments:

Note: C - 64 d.v., C1 - 128 d.v., C2 - 256 d.v., C3 - 512 d.v., C4 - 1024 d.v., C5 - 2048 d.v., C6 - 4096 d.v., C7 - 8192 d.v.

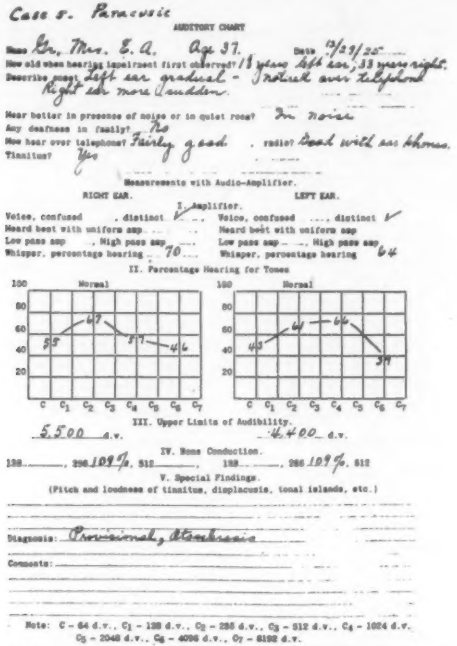
Fig. 4. Note the relatively best hearing for the middle register; the marked loss of hearing for the low tones, indicating a fixative process; and the increased bone-conduction.

to determine the interfering effect of pure tones upon the hearing of speech-sounds.

Each of these methods has its own particular value. The measurement of the acuity of hearing for pure tones is of value because it gives a precise answer to the effect of noise upon the hearing acuity. With the recently-developed instruments of precision, employing vacuum-tube circuits, it is possible to determine the exact loudness threshold for a tone of any given pitch, whether in the

quiet or in a noise. On the other hand, although less precise, the speech tests are peculiarly valuable in this study because the paracusic patient, in a noise, lays particular stress upon his improved ability to hear the conversational voice.

A special apparatus was constructed for producing a typical noise. It was desirable to produce a noise that would contain all of the audible frequency components. To accomplish this two vacuum-tube oscillators were connected with the same loud-speaker, as


Case 5. Paracusis

AUDITORY CHART

Name Mr. Mrs. E. A. Age 37. Date 12/21/25

How old when hearing impairment first observed? 18 years left ear, 33 years right.

Describe onset: Left ear gradual - noticed over telephone
Right ear more sudden.

Hear better in presence of noise or in quiet room? In noise

Any deafness in family? No

How hear over telephone? Fairly good. radio? Good with ear horn.

Tinnitus? Yes

Measurements with Audio-Amplifier.

RIGHT EAR. LEFT EAR.

I. Amplifier.

Voice, confused . distinct V Voice, confused . distinct V

Heard best with uniform amp Heard best with uniform amp

Low pass amp . High pass amp Low pass amp . High pass amp

Whisper, percentage hearing 70 Whisper, percentage hearing 64

II. Percentage Hearing for Tones

100 Normal 100 Normal

80 80

60 67 60 64 66

40 55 57 46 40 43 39

20 20

C C_1 C_2 C_3 C_4 C_5 C_6 C_7 C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility

5500 d.v. 4400 d.v.

IV. Bone Conduction.

128 , 256 100% , 512 , 128 , 256 100% , 512

V. Special Findings.

(Pitch and loudness of tinnitus, diplacusis, tonal islands, etc.)

Diagnosis: Provisional, Otosclerosis

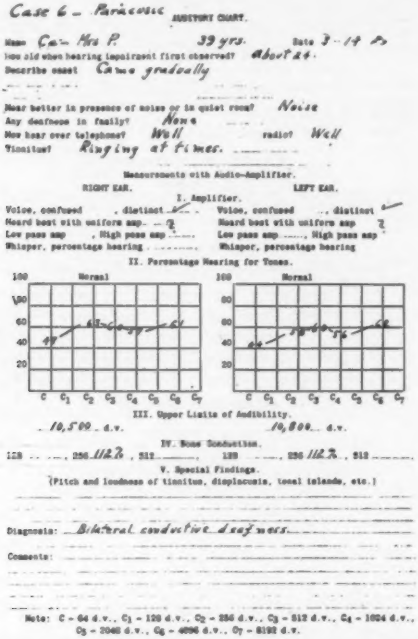
Comments:

Note: C - 64 d.v., C_1 - 128 d.v., C_2 - 256 d.v., C_3 - 512 d.v., C_4 - 1024 d.v. C_5 - 2048 d.v., C_6 - 4096 d.v., C_7 - 8192 d.v.

Fig. 5. Typical picture of otosclerosis, although there is no history of deafness in the family.

shown in Fig. 14. One of the oscillators produces a constant frequency of 50,000 d.v. The other oscillator produces frequencies which are continuously varying between 30,000 d.v. and 50,000 d.v. This variation in frequency, in the second oscillator, is produced by rotating, with the aid of an electric motor, the movable plates of an ordinary radio air condenser. Because of the rapid rotation of these condenser plates—15 revolutions per second—the variation in frequency between 30,000 and 50,000, and then back to 30,000, occurs in approximately one-fifteenth of a second. The oscillator,

therefore, runs through this cycle of frequencies 15 times a second. When the constant oscillator and the variable oscillator are simultaneously producing 50,000 d.v., the beat frequency between the two is zero—that is, there are no beats. When the one is 50,000 and the other is 30,000 the beat frequency is 20,000—that is, the difference between these two frequencies. What the ear actually hears, therefore, is a continuous variation of frequency between zero and 20,000. Since the upper pitch limit of audibility is 20,000, the


Case 6 – Paracusis AUDITORY CHART.

Name Mrs P. 39 yrs. Date 3-14 P.

How old when hearing impairment first observed? about 24.

Describe onset Came gradually

Hear better in presence of noise or in quiet room? Noise

Any deafness in family? None

How hear over telephone? Well radio? Well

Tinnitus? Ringing at times.

Measurements with Audio-Amplifier.

RIGHT EAR. I. Amplifier. LEFT EAR.

Voice, confused , distinct . Voice, confused , distinct

Heard best with uniform amp. Heard best with uniform amp

Low pass amp , High pass amp Low pass amp , High pass amp

Whisper, percentage hearing Whisper, percentage hearing

II. Percentage Hearing for Tones.

100 Normal 100 Normal

C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility.

10,500 d.v. 10,800 d.v.

IV. Bone Conduction.

128 , 256 112% , 512 , 128 , 256 112% , 512

V. Special Findings.

(Pitch and loudness of tinnitus, diplacusis, tonal islands, etc.)

Diagnosis: Bilateral conductive deafness

Comments:

Note: C = 64 d.v., C_1 = 128 d.v., C_2 = 256 d.v., C_3 = 512 d.v., C_4 = 1024 d.v., C_5 = 2048 d.v., C_6 = 4096 d.v., C_7 = 8192 d.v.

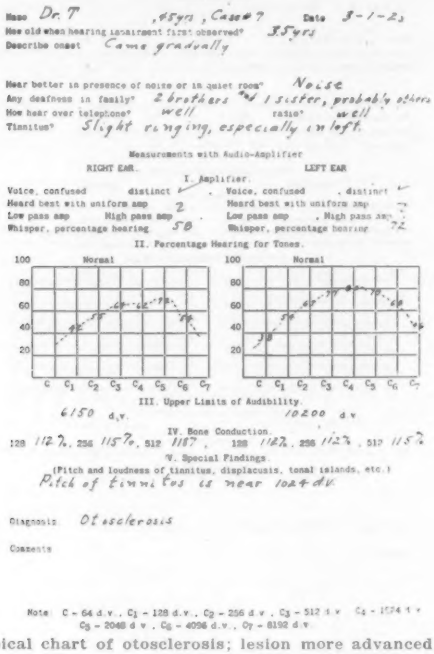
Fig. 6. Note that the amplified voice is heard distinctly, indicating good cochlear function. This patient hears well with an artificial aid, consisting of a vacuum-tube amplifier constructed to meet her particular requirements.

50,000 frequencies and the 30,000 to 50,000 frequencies are not heard. What the ear actually hears, therefore, are beats produced by the variation between the two primary tones. However, this continuously varying beat-frequency which the ear hears has lost all tonal property, because the variation is so rapid. The resultant sensation is a very complex noise, made up of all the frequencies throughout the entire audible range. In this way, there is produced

what might be termed a "blanket" noise, in that it includes all audible frequencies.

TESTS OF THE ACUITY FOR PURE TONES.

These tests were first conducted in the quiet, in the usual manner of making audiometric measurements. A pure tone, produced with a vacuum-tube oscillator, is reduced in loudness until the individual being tested can just barely hear it. This gives the minimal threshold for this particular tone. This test is repeated for tones of dif-


AUDITORY CHART

Name Dr. T ,45yrs , Case# ? Date 3-1-23

How old when hearing impairment first observed? 35yrs

Describe onset Came gradually

Hear better in presence of noise or in quiet room? Noise

Any deafness in family? 2 brothers and 1 sister, probably others

How hear over telephone? well ratio? well

Tinnitus? Slight ringing, especially in left.

Measurements with Audio-Amplifier

RIGHT EAR. LEFT EAR

I. Amplifier.

Voice, confused distinct ✓ Voice, confused distinct ✓

Heard best with uniform amp 2 Heard best with uniform amp 2

Low pass amp High pass amp Low pass amp High pass amp

Whisper, percentage hearing 50 Whisper, percentage hearing 72

II. Percentage Hearing for Tones.

100 Normal 100 Normal

80 80

60 60

40 40

20 20

C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility.

6150 d.v. 10200 d.v.

IV. Bone Conduction.

128 112%, 256 115%, 512 118%, 128 112%, 256 112%, 512 115%

V. Special Findings.

(Pitch and loudness of tinnitus, displacusis, tonal islands, etc.)

Pitch of tinnitus is near 1024 d.v.

Diagnosis Otosclerosis

Comments

Note C - 64 d.v., C_1 - 128 d.v., C_2 - 256 d.v., C_3 - 512 d.v. C_4 - 1024 d.v. C_5 - 2048 d.v., C_6 - 4096 d.v., C_7 - 8192 d.v.

Fig. 7. Typical chart of otosclerosis; lesion more advanced in right ear.

ferent pitch. Special ear pieces are used for this test. These ear pieces hold the receiver one inch away from each ear. Each ear piece consists of a circular supporting frame which is perforated so that the noise can be introduced between the receiver and the ear. Fig. 15 is a photograph showing the construction of the ear pieces, the manner in which they are supported near the patient's ears, and showing also the general method of making the tests. After the tests in the quiet are completed the patient is then tested in a noise.

The noise comes from a loud-speaker located near the patient. By means of a volume control the loudness of the noise is reduced until the patient can just barely hear it. The loudness of the noise is then increased to twenty sensation units above this minimal threshold. This loudness corresponds to an increase in the intensity of the noise 100 times the barely audible loudness. The tests for the acuity of pure tones are then repeated in the presence of this noise.

Case 8. Paracusis

AUDITORY CHART

Name Lan, Wirth Age 10 Date 1-22-23

How old when hearing impairment first observed? 5 yrs. ago

Describe onset Before removal of tonsils and adenoids - slightly; afterwards - slightly; gradual progress in school. Very bad when he has a cold.

Hear better in presence of noise or in quiet room? Noise.

Any deafness in family? Grandmother, Maternal, Aunt had trouble with hearing

How hear over telephone? Yes. radio? Not knowing

Tinnitus? Roaring, like turns head, sometimes sounds like a steam engine.

Measurements with Audio-Amplifier

RIGHT EAR. LEFT EAR

I. Amplifier

Voice, confused , distinct Voice, confused distinct

Heard best with uniform amp Heard best with uniform amp

Low pass amp , High pass amp Low pass amp , High pass amp

Whisper, percentage hearing Whisper, percentage hearing

II. Percentage Hearing for Tones.

100 Normal 100 Normal

80 60 40 20

C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility.

12,500 d.v. 12,500 d.v

IV. Bone Conduction.

128 256 11 6% 512 128 256 11 4% 512

V. Special Findings

(Pitch and loudness of tinnitus, diaplacusis, tonal islands, etc.)

Diagnosis: Conductive impairment, bilateral

Comments:

Note: C - 64 d.v. , C_1 - 128 d.v. , C_2 - 256 d.v. , C_3 - 512 d.v. C_4 - 1024 d.v. C_5 - 2048 d.v.. C_6 - 4096 d.v. C_7 - 8192 d.v.

Fig. 8. This case was selected because the patient hears only slightly better in the presence of a noise; it is to be noted that the conductive lesion is also of slight degree.

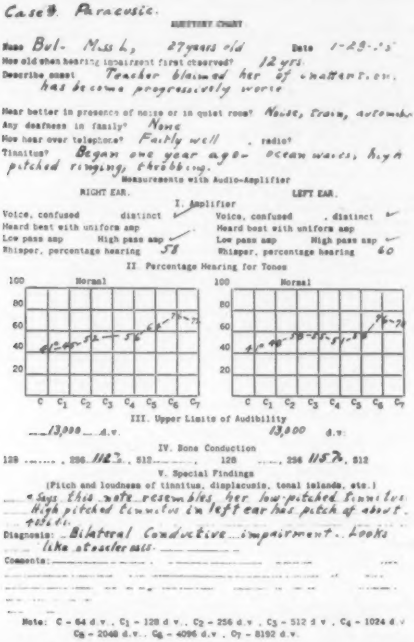
The loudness of the noise is then further increased to thirty sensation units—an increase in the intensity of the noise of 1,000 times the barely audible loudness. The tests for the acuity of pure tones are then repeated in this noise.

In some instances these tests were repeated in a noise of forty sensation units.

SPEECH ARTICULATION TESTS.

The speech articulation tests are similar to those employed by telephone engineers in testing the efficiency of speech transmission

in telephone equipment. A speaker, or caller, calls out a series of meaningless monosyllabic speech-sounds. An observer listens to these speech-sounds and records what he hears, or thinks he hears. Each speech-sound is a vowel-consonant, a consonant-vowel, or a consonant-vowel-consonant combination. These speech-sounds are arranged in groups of fifty. The patient listens, whether in the quiet or in the presence of a noise, and repeats what he hears, and a trained assistant records each syllable. The number and nature of the er-


Case #. Paracusis.

HISTORY CHART

Name Bul- Miss L, 27 years old Date 1-29-'25

How old when hearing impairment first observed? 12 yrs.

Describe onset Teacher blamed her of inattention. has become progressively worse

Hear better in presence of noise or in quiet room? Noise, trains, automobiles

Any deafness in family? None

How hear over telephone? Fairly well , radio?

Tinnitus? Began one year ago- ocean waves, high pitched ringing, throbbing.

Measurements with Audio-Amplifier

RIGHT EAR. LEFT EAR.

I. Amplifier

Voice, confused distinct Voice, confused , distinct

Heard best with uniform amp Heard best with uniform amp

Low pass amp High pass amp Low pass amp High pass amp

Whisper, percentage hearing 58 Whisper, percentage hearing 60

II. Percentage Hearing for Tones

Normal

100 80 60 40 20

C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility

13,000 d.v. 13,000 d.v.

IV. Bone Conduction

128 ..... , 256 112 , 512 ..... ; 128 ....., 256 115 , 512

V. Special Findings

(Pitch and loudness of tinnitus, diplacusis, tonal islands, etc.)

Says this note resembles her low-pitched tinnitus. High pitched tinnitus in left ear has pitch of about 4096 d.v.

Diagnosis: Bilateral Conductive impairment. Looks like otosclerosis.

Comments:

Note: C - 64 d.v., C_1 - 128 d.v., C_2 - 256 d.v., C_3 - 512 d.v., C_4 - 1024 d.v. C_5 - 2048 d.v., C_6 - 4096 d.v., C_7 - 8192 d.v.

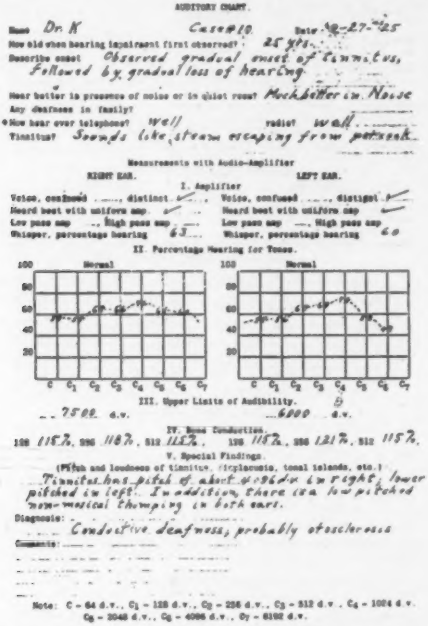
Fig. 9. The amplified voice is heard distinctly, indicating good cochlear function; in each ear there is a tinnitus of about 64 d.v., and in addition the left ear exhibited another tinnitus of about 4000 d.v.

rors that he makes are obtained by comparing the called and the recorded lists.

In the previous tests, the pure tones were introduced through the receiver and the noise was introduced through the openings between the receiver and the spoken voice introduced through the openings between the receiver and the ear. Thus, the caller does not hear the noise and consequently the noise does not influence the loudness of his speech.

The noise is first maintained at a loudness of twenty sensation units; again at thirty sensation units; and at times at forty sensation units. These are the same standard levels of loudness as those used in the tests for the acuity of pure tones.

Similar speech articulation tests were conducted, using pure tones instead of the noise as the interfering factor. These tests included the introduction of low, medium and high tones. The loudness levels of these tones were twenty, thirty and forty sensation units—the


AUDITORY CHART.

Name Dr. K Case #10 Date 12-27-'25

How old when hearing impairment first observed? 25 yrs.

Describe onset Observed gradual onset of tinnitus, followed by gradual loss of hearing

Hear better in presence of noise or in quiet room? Much better in Noise

Any deafness in family?

How hear over telephone? Well radiot Well

Tinnitus? Sounds like steam escaping from pressure

Measurements with Audio-Amplifier

RIGHT EAR. LEFT EAR.

I. Amplifier

Voice, confused ..... distinct ✓ Voice, confused ..... distinct ✓

Heard best with uniform amp ✓ Heard best with uniform amp ✓

Low pass amp .. High pass amp ..... Low pass amp —. High pass amp

Whisper, percentage hearing 65 Whisper, percentage hearing 60

II. Percentage Hearing for Tones.

100 Normal 100 Normal

80 80

60 60

40 40

20 20

C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility.

7500 d.v. 6000 d.v.

IV. Bone Conduction.

128 115%, 256 118%, 512 115%, 128 115%, 256 121%, 512 115%.

V. Special Findings.

(Pitch and loudness of tinnitus, diplacusis, tonal islands, etc.)

Tinnitus has pitch of about C#64d.v. in right, lower pitched in left. In addition, there is a low pitched non-musical thumping in both ears.

Diagnosis: Conductive deafness, probably otosclerosis

Comments:

Note: C = 64 d.v., C_1 = 128 d.v., C_2 = 256 d.v., C_3 = 512 d.v., C_4 = 1024 d.v., C_5 = 2048 d.v., C_6 = 4096 d.v., C_7 = 8192 d.v.

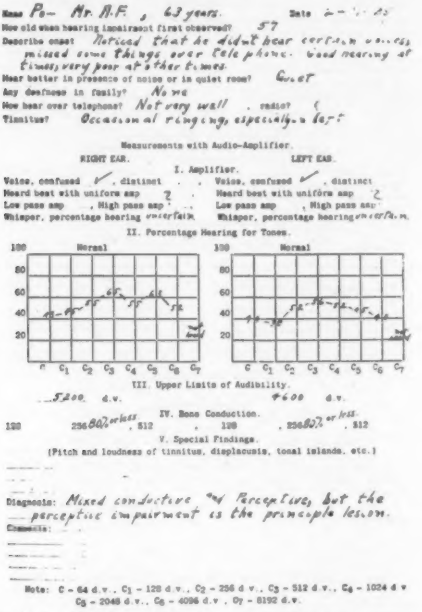
Fig. 10. The amplified voice is heard distinctly, indicating good cochlear function for the range of the voice; the findings suggest otosclerosis, but there is not the characteristic degree of loss of hearing for the low frequences.

same loudness levels as were used with the noise. In all of the tests, whether with noise or tones, the loudness of forty sensation units was used only when the minimal threshold was sufficiently low to permit of such a multiplication of intensity.

Throughout all the speech tests, the same individual acted as the "caller." The caller, one of the writers, has conducted such experiments routinely for a period of three years and has, therefore, developed a standard technic. This experience was helpful in minimizing

the error which might occur from varying the loudness or quality of the speech-sounds.

The results of each speech test are expressed in terms of the percentage syllable articulation, the percentage vowel articulation, and the percentage consonant articulation. The percentage syllable articulation was determined by counting the number of speech-sounds which were heard correctly. In a similar manner, the percentage vowel articulation was determined by counting the number of vowels


Case II - Perceptive

Name Po- Mr. A.F., 63 years. Date

How old when hearing impairment first observed? 57

Describe onset Noticed that he didn't hear certain voices, missed some things over tele phone. Good hearing at times, very poor at other times.

Hear better in presence of noise or in quiet room? Quiet

Any deafness in family? No one

How hear over telephone? Not very well , radio? (

Tinnitus? Occasional ringing, especially on left

Measurements with Audio-Amplifier.

RIGHT EAR. LEFT EAR.

I. Amplifier.

Voice, confused ✓, distinct . . Voice, confused ✓, distinct

Heard best with uniform amp ? . Heard best with uniform amp ?

Low pass amp , High pass amp . Low pass amp , High pass amp

Whisper, percentage hearing unintelligible Whisper, percentage hearing unintelligible

II. Percentage Hearing for Tones.

Normal Normal

C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility.

5200 d.v. 4600 d.v.

IV. Bone Conduction.

128 256 Whisper, 512 , 128 , 256 Whisper or less, 512

V. Special Findings.

(Pitch and loudness of tinnitus, displacusis, tonal islands, etc.)

Diagnosis: Mixed conductive and Perceptive, but the perceptive impairment is the principle lesion.

Comments:

Note: C - 64 d.v., C_1 - 128 d.v., C_2 - 256 d.v., C_3 - 512 d.v., C_4 - 1024 d.v., C_5 - 2048 d.v., C_6 - 4096 d.v., C_7 - 8192 d.v.

Fig. 11. Note the contrast with the preceding ten cases; the later age of onset; does not hear well over the telephone; hears better in the quiet; amplified voice, confused; amplified whisper scarcely heard at all; and the decreased bone-conduction.

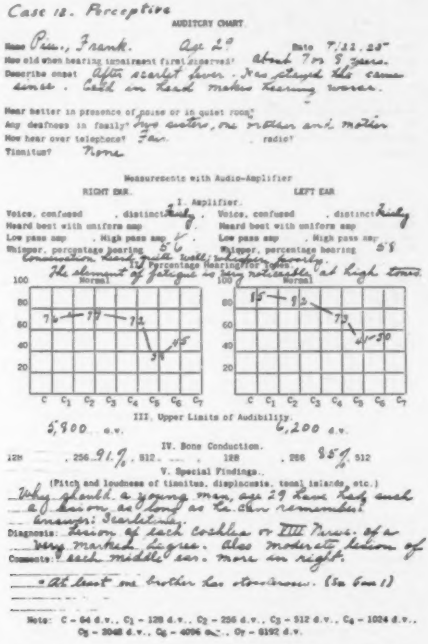
which were heard correctly. The consonant articulation was similarly determined, by actual count.

All of the above tests are quantitative, thus permitting statistical deductions. In addition, certain qualitative tests were made. Observations were made upon the effect of noise upon conversation between normals and paracusics; between normals and perceptives; between paracusics and perceptives; and, finally, between two or more paracusics.

RESULTS OF EXPERIMENTS.

1. The effect of noise upon the minimal threshold for the hearing of pure tones.

a. In the normal. Fig. 16 shows the characteristic effect of noise on the normal. The dash-dot line shows the percentage hearing for pure tones in the quiet. The dotted line shows the percentage hearing in the presence of a noise, of a loudness of twenty sensation units. The solid line shows the percentage hearing in the presence


Case 12. Perceptive

AUDITORY CHART

Name Pres., Frank. Age 29 Date 7.12.25

How old when hearing impairment first observed? about 7 or 8 years.

Describe onset After scarlet fever. Has always had same. Could not hear makes hearing worse.

Hear better in presence of noise or in quiet room?

Any deafness in family? Two sisters, one mother and mother

How hear over telephone? Fair. radio?

Tinnitus? None

Measurements with Audio-Amplifier

RIGHT EAR. LEFT EAR

I. Amplifier.

Voice, confused . distinct Fairly. Voice, confused . distinct Fairly

Heard best with uniform amp Heard best with uniform amp

Low pass amp . High pass amp 6. Low pass amp . High pass amp

Whisper, percentage hearing 56 Whisper, percentage hearing 56

Conversation heard quite well, telephone heard by.

II. Percentage Hearing for Tones.

The element of fatigue is very noticeable at high tones.

100 Normal 100 Normal

80 60 40 20

C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility.

5,900 d.v. 6,200 d.v.

IV. Bone Conduction.

128 . 256 91% . 512 . 128 . 256 85% 512

V. Special Findings.

(Pitch) and loudness of tinnitus, diplacusis, tonal islands, etc.)

Why should a young man, age 29 have lost such a hearing as he has when remember? — knows: Scarlet fever.

Diagnosis: Lesion of each cochlea or VIII Nerve: of a very marked degree. Also moderate lesion of each middle ear. more on right.

Comments: At least no brother has tinnitus. (Ha 6 mo!)

Note: C – 64 d.v., C_1 – 128 d.v., C_2 – 256 d.v., C_3 – 512 d.v., C_4 – 1024 d.v., C_5 – 2048 d.v., C_6 – 4096 d.v., C_7 – 8192 d.v.

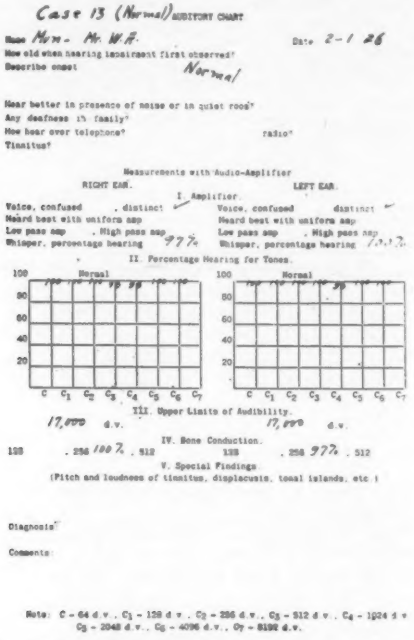
Fig. 12. Amplified voice heard fairly well, indicating fair cochlear function in the range of the voice; amplified whisper heard poorly, indicating poor cochlear function for the high frequencies of the whispered voice; decreased bone conduction.

of a noise of forty sensation units. The noise of twenty sensation units reduces the percentage hearing to about 80 per cent. The forty sensation units of noise reduce the hearing to about 67 per cent. This indicates that a normal person, in the presence of a noise of forty sensation units, would hear no better than an individual with 67 per cent of normal hearing would hear in the quiet.

b. In the perceptive. Fig. 17 shows that the noise of twenty

sensation units reduces the hearing considerably, and the noise of forty sensation units causes an even further reduction. It will be noted that the perceptive does not suffer any greater disturbance than does the normal. In fact, the chart seems to indicate that a noise is more disturbing to the normal individual, at least for the hearing of pure tones.

c. In the paracusic. Figs. 18 to 23 show that the noises of twenty, thirty or forty sensation units produce a disturbance of the


Case 13 (Normal) AUDITORY CHART

Name Mrs. Mr. W.H. Date 2-1 26

How old when hearing impairment first observed?

Describe onset Normal

Hear better in presence of noise or in quiet room?

Any deafness in family?

How hear over telephone? radio?

Tinnitus?

Measurements with Audio-Amplifier

RIGHT EAR. LEFT EAR.

I. Amplifier

Voice, confused . distinct Voice, confused distinct

Heard best with uniform amp Heard best with uniform amp

Low pass amp . High pass amp Low pass amp . High pass amp

Whisper, percentage hearing 97% Whisper, percentage hearing 100%

II. Percentage Hearing for Tones.

100 Normal 100 Normal

80 60 40 20

C C_1 C_2 C_3 C_4 C_5 C_6 C_7

III. Upper Limits of Audibility.

17,000 d.v. 17,000 d.v.

IV. Bone Conduction.

128 . 256 100% . 512 128 . 256 97% . 512

V. Special Findings

(Pitch and loudness of tinnitus, diplacusis, tonal islands, etc.)

Diagnosis

Comments

Note: C - 64 d.v., C_1 - 128 d.v., C_2 - 256 d.v., C_3 - 512 d.v., C_4 - 1024 d.v. C_5 - 2048 d.v., C_6 - 4096 d.v., C_7 - 8192 d.v.

Fig. 13. Typical chart of a person with normal hearing.

hearing of pure tones, which, qualitatively and also more or less quantitatively, is the same as that produced upon the normal or the perceptive. The greater the noise, the greater the effective diminution in the acuity for pure tones. There was no evidence to indicate that a noise of any magnitude occasioned an improvement in the acuity for tones.

In all three types of individuals, the noise produces a masking effect upon the tones. That is, the loudness of the tones has to be increased before they can be heard, whether in the normal, in the

perceptive, or in the paracusic. The noise of any magnitude, provided it could be heard, raised the minimal threshold for tones of all pitch. Further, as the loudness of the noise was increased, the loudness of the tones had to be increased in order to be audible. The paracusics did not exhibit a superior hearing acuity in the noise. They were subject to the same masking effects of noise as were the normals or the perceptives.

2. The effect of noise upon the hearing of speech-sounds. Figs. 24, 25 and 26 are photographic reproductions of sample charts used for simple articulation tests. The first column gives the speech-sound as it was heard by the listener. The second column gives the speech-sound as it was called. The third column gives the nature of the errors. A "check mark" in the third column indicates that

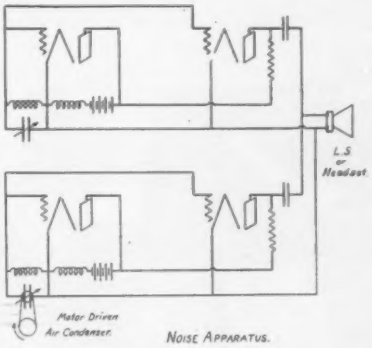


Fig. 14. Wiring diagram of apparatus used for producing a standard noise. Note that the two oscillators are connected to the same loud-speaker, or headset; also that the air-condenser in one oscillator is driven with an electric motor. The oscillator, indicated above, produces a constant frequency of 50,000 d.v.; the oscillator, indicated below, produces frequencies continuously varying between 30,000 d.v. and 50,000 d.v. There is thus produced in the loud-speaker, or headset, a "beat" frequency which continuously varies between zero and 20,000 d.v—that is, throughout the entire audible range.

the speech-sound was heard correctly. A "cross" in this column indicates an error. If the "cross" is at the righthand side of the column, it signifies an error in the final consonant. It will be noted that these errors are the most frequent. A "cross" at the lefthand side of the column signifies an error in the initial consonant. A "cross" in the middle of the column signifies an error in the vowel. An actual count of these errors gives the percentage syllable articulation, the percentage vowel articulation, the percentage consonant articulation. Eight charts or more, like the ones indicated in Figs. 24 to 26, were obtained for each patient tested. Fifty different

lists of syllables, similar to the ones shown, were used in the tests. Each list was made up of fifty speech-sounds. The lists are so constructed that all vowel and consonant sounds occur in the same proportion that they occur in ordinary conversation.

a. The effect of noise upon the hearing of speech-sound, in the normal. Fig. 27 shows the percentage articulation for vowels, consonants and syllables, in noises of different degrees of loudness. As stated before, the individual tested heard the noise through a pair of telephone receivers, each receiver being supported one inch from each ear. It will be noted that the percentage articulation for vowels, consonants and syllables decreases as the loudness of the noise increases. Even a slight noise interferes with speech perception. The curve for the syllable articulation shows that a noise of forty-nine

Fig. 15. The noise is introduced either by means of the loud-speaker, shown behind the head of the listener, or through the special receivers placed on his ears. There are perforations in the supporting frame of the ear pieces. Through these perforations the noise can be introduced by the loud-speaker, when testing for the acuity of tone; also the spoken voice can be heard through these perforations when the noise is being introduced through the ear pieces.

sensation units reduced the syllable articulation to 50 per cent. The loudness of the speech employed by the caller in these tests was approximately forty-seven sensation units. Therefore, it is of interest to note that when the noise is of approximately the same loudness as the speech that one is listening to, one hears correctly about 50 per cent of the speech-sounds. In the presence of a noise of about eighty-five units, the syllable articulation is reduced to zero—that is, none of the speech-sounds are understood. Throughout the tests it was observed that the consonant articulation suffered very much more than the vowel articulation. This is to be expected,

naturally, because the consonants contain so little energy in comparison with the vowels.

b. In the perceptive. Fig. 28 shows results similar to those obtained in the normal. As the noise increased in loudness, the percentage articulation of vowels, consonants and syllables decreased,

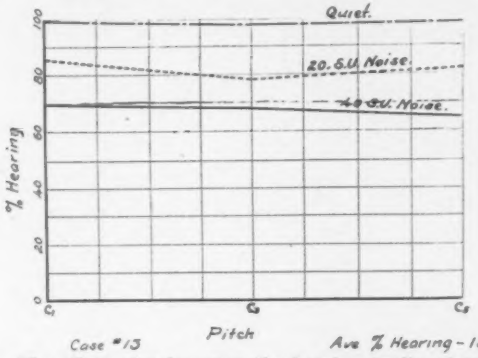


Fig. 16. The effect of noise upon the hearing acuity of pure tones, in the normal. Note that a noise of twenty sensation units reduces the acuity from 100 per cent to approximately 80 per cent; a noise of forty sensation units reduces the acuity to approximately 67 per cent.

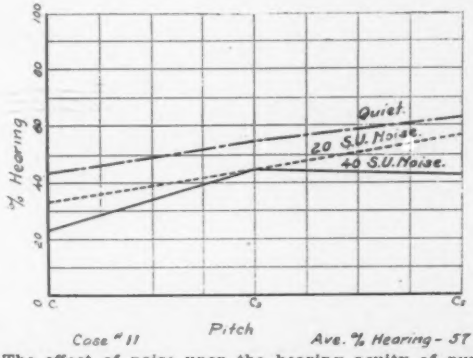


Fig. 17. The effect of noise upon the hearing acuity of pure tones, in the perceptive. The patient's average acuity for tones is 57 per cent, in the quiet. A noise of twenty sensation units reduces the acuity to about 40 per cent; a noise of forty sensation units, to approximately 35 per cent.

paripassu. As in the normal, the consonants were not heard so well as the vowels.

c. In the paracusic. Figs. 29 to 36 show precisely the same phenomenon. Any noise, whether feeble or intense, reduced the percentage articulation for vowels, consonants and syllables. Through-

out the tests, there was no evidence that the noise of any degree of loudness improved the hearing.

In order to check the general outcome of these experiments a special test was undertaken. In this test the noise was produced by a loud-speaker and not conducted by receivers directly to the ears.

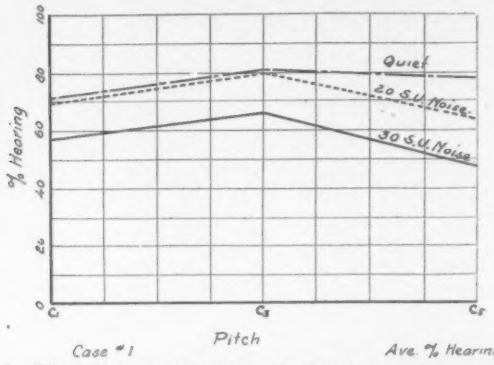


Fig. 18. The effect of noise upon the hearing acuity of pure tones, in the paracusic. Acuity in the quiet, about 77 per cent. In a noise of twenty sensation units, about 70 per cent. In a noise of thirty sensation units, about 60 per cent. Note that the paracusic hears less well as the noise increases, just as was found in the normal and the perceptive.

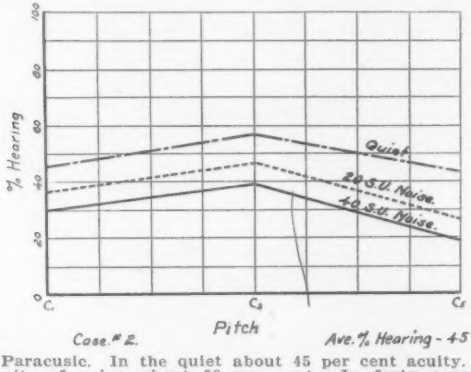


Fig. 19. Paracusic. In the quiet about 45 per cent acuity. In twenty sensation units of noise, about 38 per cent. In forty sensation units, about 32 per cent.

The caller, therefore, was also subject to the influence of the noise. In the presence of this single noise, three individuals were tested at the same time—a normal, a perceptive and a paracusic. All three individuals were placed equidistant from the caller, and also from the source of the noise. This made the test more comparable, in

that all three individuals listened at the same time to the same speech-sounds. In this test the loudness of the noise, expressed in sensation units, is based upon the normal. Thus, a noise of forty units loudness would be much less than forty units for the perceptive or the paracusic. Fig. 37 shows the percentage articulation for vowels

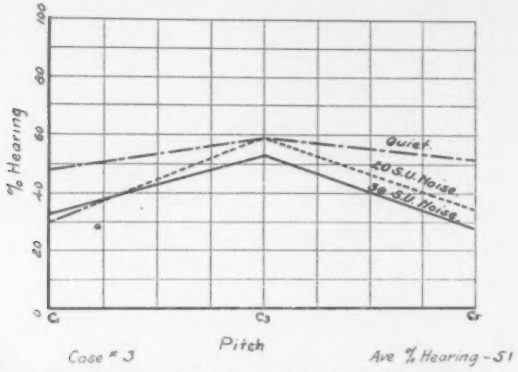


Fig. 20. Paracusic. Acuity in the quiet, about 51 per cent. In twenty sensation units, about 44 per cent. In thirty sensation units, about 40 per cent.

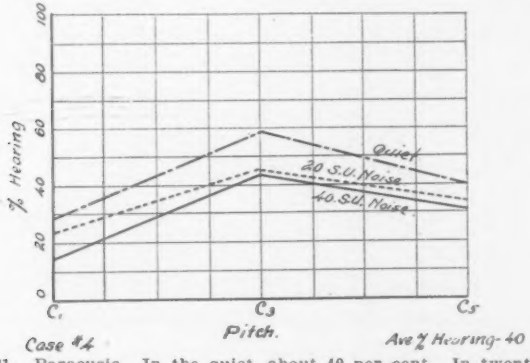


Fig. 21. Paracusic. In the quiet, about 40 per cent. In twenty sensation units of noise, about 32 per cent. In forty sensation units, about 26 per cent.

and syllables, for the three individuals. The dash-dot lines show the percentage vowel articulation, and the solid lines show the percentage syllable articulation. As the noise increased, the percentage articulation decreased, in all three individuals. It is of particular interest to note that, in the presence of the loudest noise, which in this case was sixty sensation units, the paracusic showed a higher

articulation for vowels than either the normal or the perceptive. This shows that in the presence of a very loud noise the paracusic enjoys a relative advantage in the matter of hearing of vowel sounds. It also suggests that if the paracusic supplements the hearing of vowels with the lip-reading of consonants, he may enjoy a relative

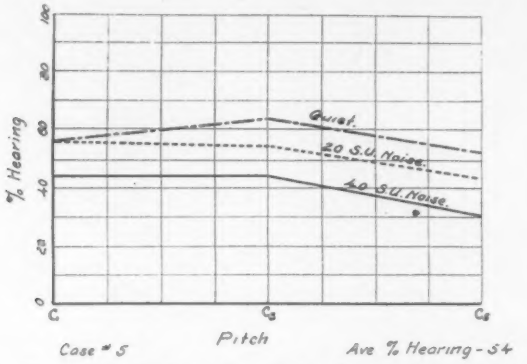


Fig. 22. Paracusic. In the quiet, about 54 per cent. In twenty sensation units of noise, about 50 per cent. In forty sensation units, about 40 per cent.

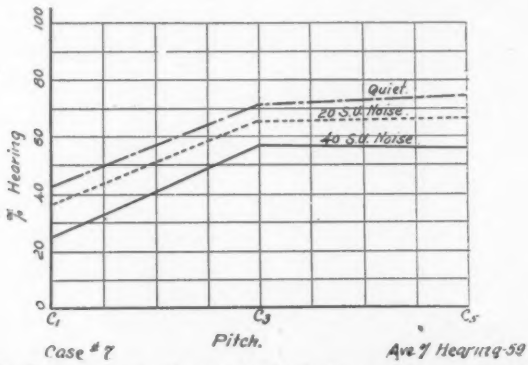


Fig. 23. Paracusic. In the quiet, about 59 per cent. In twenty sensation units of noise, about 52 per cent. In forty sensation units, about 42 per cent.

advantage over others, in the presence of a very loud noise. Whereas, in the quiet, the paracusic had a syllable articulation of only 26 per cent as compared with 94 per cent in the normal, in a noise of sixty sensation units, the paracusic had a syllable articulation of 8 per cent as compared with 31 per cent for the normal. Hence,

the normal and the paracusic were more nearly on a par in the noise than in the quiet. In a louder noise, they probably would have been even more nearly on a par. Further, whereas in the quiet and the presence of feeble noises, the perceptive heard better than the paracusic, in a noise of sixty sensation units the paracusic heard somewhat better than the perceptive.

3. The effect of pure tones upon the hearing of speech-sounds.

a. In the normal. Figs. 38 and 39 show the interfering effect

DEPARTMENT OF HYGIENE
Southern Branch, University of California

ARTICULATION TEST RECORDING SHEET

Title of Test: Hearing in a Noise
Condition Tested: Normal in Noise of 40 S.U.
Date: 2-28-25 Case #13 Observer: H. Knudsen
Test No.: No. 4 Normal. Caller: Knudsen
List No.: 2 Syllable Articulation: 66

Vowel Articulation: 90.5 Consonant Articulation: 88

NO	OBSERVED	CALLED	WRONG	NO	OBSERVED	CALLED	WRONG
1	hav	hav	✓	26	ĕr	ĕr	✓
2	rĕf	rĕf	✓	27	rŭg	rŭb	x
3	hij	hig	✓	28	pus	pus	✓
4	wich	wik	x	29	bŭch	bŭch	✓
5	bosh	bosh	✓	30	zif	zif	✓
6	chal	chal	x	31	tif	tif	✓
7	serd	serd	✓	32	nĕv	nĕv	✓
8	jersh	jersh	✓	33	dom	dom	✓
9	haun	haung	x	34	tīj	tīj	✓
10	ĕm	ĕn	x	35	wăn	wăn	✓
11	yerg	yerb	x	36	ĕk	ĕk	✓
12	sīm	sīn	✓	37	ging	rĕng	x x
13	năng	nang	✓	38	dŭch	dŭch	✓
14	yos	yuz	x x	39	dik	gou	x
15	shĕt	shĕt	✓	40	yŭg	yŭg	✓
16	dăm	dăm	✓	41	lab	lab	✓
17	răth	găth	x	42	zī	zī	✓
18	yū	rū	x	43	nerch	nerch	✓
19	ăt	hă	x x	44	kĕp	kĕp	✓
20	mī	mī	✓	45	yīk	yīk	✓
21	vash	vash	✓	46	hef	pef	x
22	hing	thing	x x	47	ăp	ăth	x
23	dout	dout	✓	48	lăt	lăt	✓
24	răg	lăg	x	49	dath	dath	✓
25	rŭf	ruf	x	50	wos	wos	✓

Fig. 24. Chart for speech-articulation. This chart is of a normal, in a noise of forty sensation units.

of tones of 128 d.v., 256 d.v., 512 d.v., 1024 d.v., 2048 d.v., and 4096 d.v., respectively. In Fig. 38 the percentage vowel, consonant and syllable articulation are shown for varying degrees of loudness of the interfering tone. Fig. 39 shows how the percentage articulation for vowels, consonants and syllables varied with the pitch of the interfering tone, at two different loudness levels, *viz.*, forty-seven sensation units, the loudness of the speech used in these tests, and also seventy sensation units. Tones of all gradations of pitch

and loudness were found to interfere with the acuity of hearing for articulated speech. The interference produced by the low tones, however, especially as they became louder, was very much greater than the interference produced by the high tones. In the case of low-pitched tones, for example, 128 d.v. or 256 d.v., it is possible, if these tones are loud enough, to completely obliterate the speech. The low-pitched tones interfered with both vowels and consonants. The high-pitched tones interfered particularly with consonants.

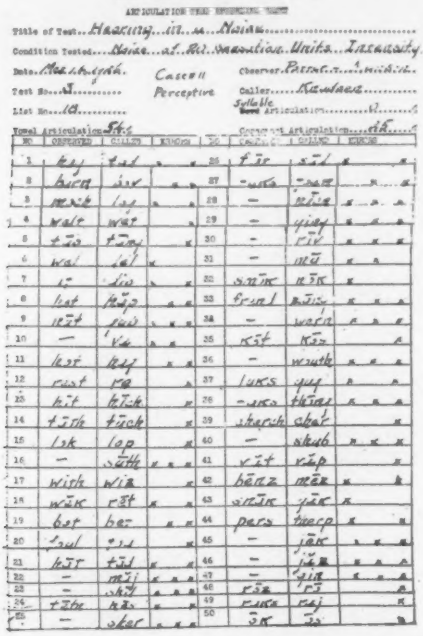


Fig. 25. Chart of speech-articulation, of a perceptive, in a noise of twenty sensation units.

Tones above 4096 d.v. produced no essential interference upon the vowels, and only a slight interference upon the consonants.

b. In the paracusic. Identical tests were made on two individuals who exhibited paracusis, with interfering tones of 256 d.v. and 1024 d.v. As soon as either of these interfering tones became audible, there occurred a diminished acuity for the hearing of speech. As the loudness of the interfering tone was increased, the acuity for the hearing of speech became less and less. Figs. 40 to 43 show

how the percentage vowel, consonant and syllable articulation decreased as the loudness of the interfering tone was increased. Here again, as in the normal, tones not only did not improve the hearing, but in all cases interfered with the hearing.

4. Qualitative Tests. The effect of noise on the conversation between a normal and a paracusic. The quantitative tests given above have been supplemented by some qualitative tests. In the first qualitative test a pronounced paracusic, Case 10, and a person with

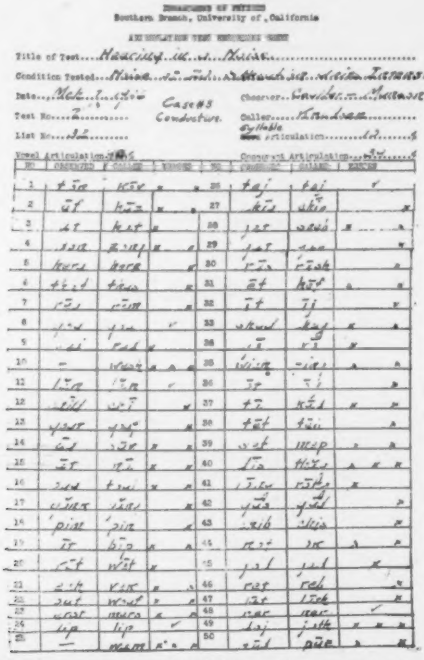


Fig. 26. Chart of speech-articulation, of a paracusic, in a noise of twenty sensation units.

normal hearing were placed in a closed reverberant garage, and the motor of a large automobile was set running at a high speed with the "cutout" open. This produced a very loud noise. The normal and the paracusic were placed equidistant from the source of the noise and also equidistant from a third person, who acted as caller. Both listeners had their backs toward the caller. The caller then raised his voice until he could be heard by one or the other. The paracusic heard as soon as the normal. One of the writers was the

normal and the other was the caller. It was apparent that the noise tended to place the normal and the paracusic on a par. Before the noise was started the normal heard very well and the paracusic heard very poorly. The only conclusion that could be relied upon

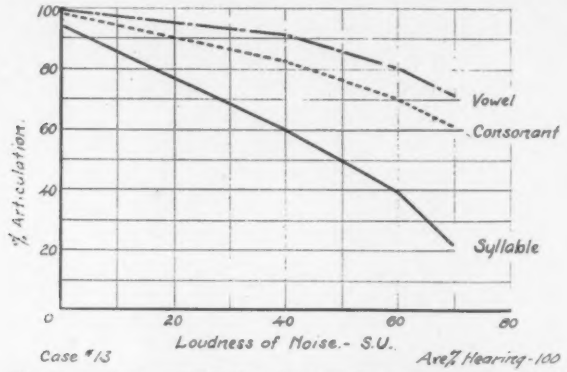


Fig. 27. Percentage articulation for vowels, consonants, and syllables, in the normal. As the noise increases up to seventy sensation units, the vowel articulation decreased from 100 per cent to 71 per cent; the consonant articulation decreased from 97 per cent to 61 per cent; the syllable articulation decreased from 94 per cent to 22 per cent.

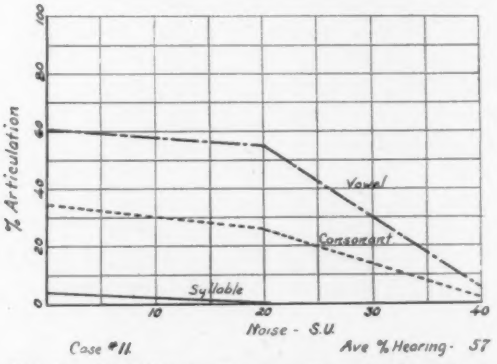


Fig. 28. Speech articulation in the perceptive. As the noise is increased up to forty sensation units, the vowel articulation is decreased from 60 per cent to 7 per cent; the consonant articulation is decreased from 34 per cent to 3 per cent. In this case the syllable articulation, in the quiet, was only 4 per cent; in a noise of twenty sensation units it dropped to zero.

was that the paracusic, as compared with the normal, heard relatively better in the presence of a noise.

In another qualitative test, the conversation in the presence of a noise, between one of the writers (a normal) and a paracusic,

Case 6, showed that the normal was conscious of speaking louder; that to the observer the paracusic did not seem to be speaking any louder (in fact, because of the noise it appeared that the paracusic did not speak even so loudly as when in the quiet). The comparison between the two individuals, first in the quiet and then in the pres-

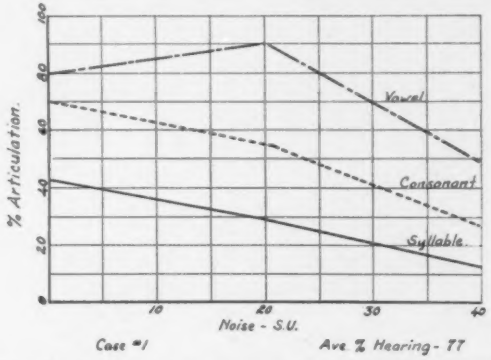


Fig. 29. Speech articulation in a paracusic, in a noise of twenty, thirty and forty sensation units.

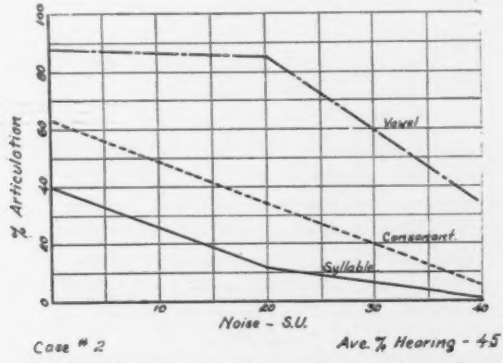


Fig. 30. Speech articulation in a paracusic, in a noise of twenty, thirty and forty sensation units.

ence of the noise, showed that the paracusic was at a relative advantage in a noise.

In another experiment in which a normal and a paracusic, Case 6, were placed in the presence of a noise, one of the writers, who acted as caller, again raised his voice until he could be heard by one or the other. In this qualitative experiment there was no uncertainty

about the outcome. The normal could hear better than the paracusic, in any loudness of noise. The normal and the paracusic, in this test, were the same individuals that were tested quantitatively and whose speech articulation data are shown in Fig. 37. Reference to this chart will show that in the greatest noise the word articulation for the normal was reduced to 31 per cent, whereas the word articu-

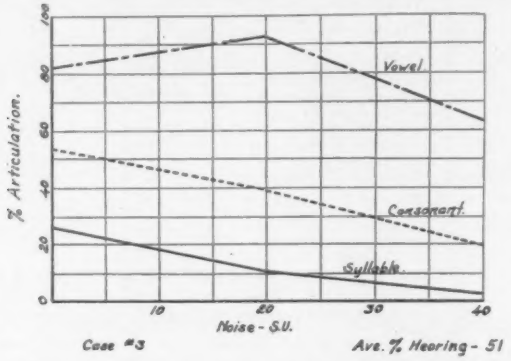


Fig. 31. Speech articulation in a paracusic, in a noise of twenty, thirty and forty sensation units.

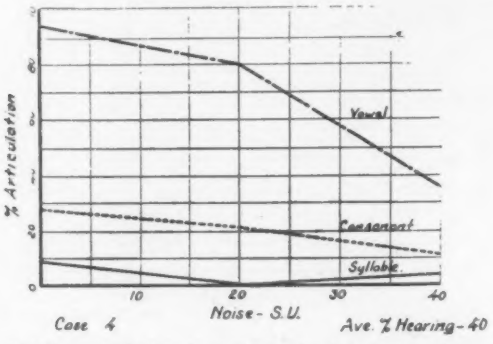


Fig. 32. Speech articulation in a paracusic, in a noise of twenty, thirty and forty sensation units.

lation for the paracusic, in this same noise, was reduced to 8 per cent. These data confirm this qualitative experiment.

A conversation between a normal and a perceptive, Case 12, demonstrated that in the presence of a noise the normal heard much better. This qualitative test is also corroborated by the quantitative data given in Fig. 37. In the loudest noise the word articulation for

the perceptive was only 2 per cent, as compared with 31 per cent for the normal.

A conversation between a paracusic, Case 6, and a perceptive, Case 12, demonstrated that in the presence of a noise the paracusic heard considerably better. At least one of the reasons for this was

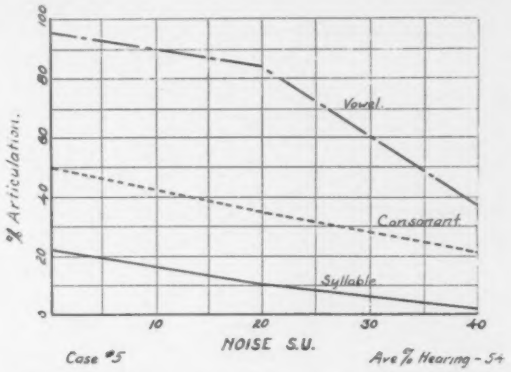


Fig. 33. Speech articulation in a paracusic, in a noise of twenty, thirty and forty sensation units.

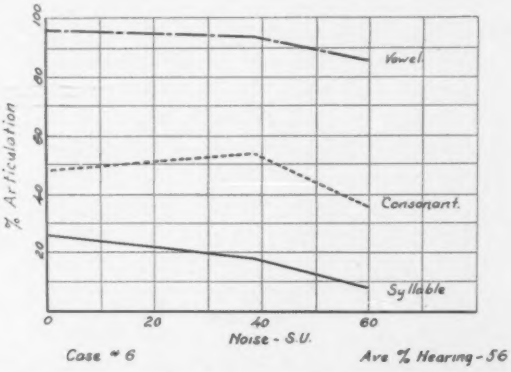


Fig. 34. Speech articulation in a paracusic, in a noise of twenty, thirty and forty sensation units.

noted in that the perceptive spoke much louder than did the paracusic. This qualitative test also is confirmed by the quantitative tests shown in Fig. 37. In the noise of thirty-eight sensation units (for the normal) the perceptive had a word articulation of 42 per cent, as compared with 18 per cent for the paracusic. However, in

the noise of sixty sensation units the perceptive dropped down to 2 per cent, as compared with 8 per cent for the paracusic.

The effect of noise on the conversation between one paracusic and another paracusic, as suggested by Kranz.

A test was conducted with three paracusics, Cases 2, 4 and 7. With the three patients it was possible to test the effect of noise on three

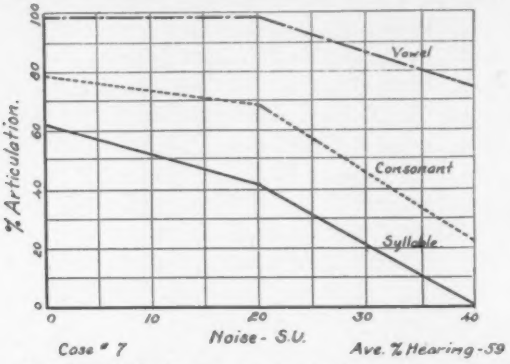


Fig. 35. Speech articulation in a paracusic, in a noise of twenty, thirty and forty sensation units.

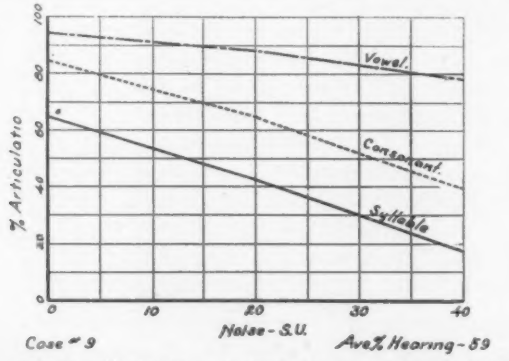


Fig. 36. Speech articulation in a paracusic, in a noise of twenty, thirty and forty sensation units.

different pairs. Cases 2 and 7 conversed together, first in the quiet and then in a noise, which was gradually increased from a barely audible loudness up to a loudness of forty units. Neither was conscious of any improvement of hearing during exposure to any loudness level of the noise. Case 7 was not able to determine any difference in his ability to hear in the quiet or in any variation of the noise.

Case 2, on the other hand, was of the opinion that he could hear his colleague's conversation better in the quiet. Both of these cases were physicians, one an otologist. Before the test, they both held the opinion that a noise improved their hearing. After this test, they both were sure that the noise had not helped them to hear each other's conversation.

The above procedure was repeated with Case 7 and Case 4. Both patients stated that they heard each other no better, and possibly not so well in the noise as in the quiet.

The same test was conducted with Case 2 and Case 4. Again Case 2 thought that he heard better in the quiet, and Case 4 was not able to determine any difference.

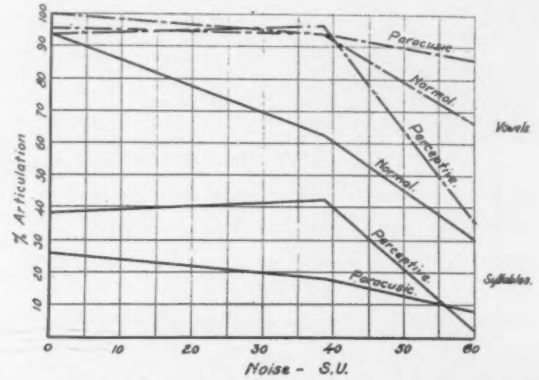


Fig. 37. Speech articulation tests of a normal, a perceptive and a paracusic, all taken at the same time in the same noise. For the vowel articulation, the normal was more disturbed by the noise than was the paracusic. In the syllable articulation, note that at zero, in the quiet, the normal had a syllable articulation of 94 per cent, and the paracusic, 26 per cent; in a noise of sixty sensation units, based on the normal, the normal showed 31 per cent, and the paracusic, 8 per cent. The normal and the paracusic, therefore, were more nearly on the same plane in the presence of a noise than they were in the quiet.

A test was then made with all three conversing together. All three stated that no gradation of noise improved their hearing of each other's conversation. On the contrary, when the noise became very loud, both Case 2 and Case 7, who are not so deaf as Case 4, stated that they heard less well than in the quiet.

All of these tests indicated that a noise did not improve the hearing of conversation between paracusics.

DISCUSSION.

The study of the material on this subject reveals a great diversity of opinion; consequently, it is important to consider these observa-

tions and opinions before discussing the significance of the above tests.

Paracusis was observed, and an attempt to explain it made by Thomas Willis in the latter half of the seventeenth century. He ascribed the phenomenon to a relaxation of the drum membrane. He considered that the noise, in some way, restored this relaxation to a normal condition of tension. Roosa gives a translation of an interesting paragraph which appears in the collected works of Thomas Willis:[84] "Indeed, a certain kind of deafness occurs, in which, although the patient seemed completely to lack the sense of hearing, yet so long as a great din, such as that of bombardments, or chimes of bells, or roar of drums, resounds about their ears, they take in distinctly the conversation of those about them, and answer questions intelligently, but, upon the ceasing of such tremendous uproar,

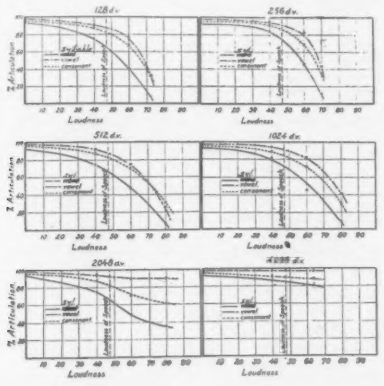


Fig. 38. The interfering effect of tones upon the reception of speech, in the normal. Note that tones of low pitch produce a greater interfering effect than tones of high pitch.

they immediately become deaf again. I once heard it from a trustworthy man, that he had been acquainted with a woman, who, although she was deaf, would, nevertheless, distinctly hear whatever was said so long as a drum was beaten within the room, and consequently her husband employed a drummer as a household servant, in order that by his aid he might occasionally hold conversation with his wife. I have also been told of another deaf person, living near a bell-tower, who could easily hear any voice when the bells were pealing, but not otherwise. Doubtless the reason of these things is that the membrana tympani, habitually relaxed, when left to itself, was forced by the shock of the sound much more intense than usual,

to a state of tension sufficient to enable it to perform its function in some degree." Roosa's opinion was "The proof is overwhelming that a large class of persons with impairment of hearing not only hear *better,* but hear perfectly well in noisy places." He felt that he was justified in drawing the following conclusions: "*1.* There is a large class of people suffering from impairment of hearing in quiet places, who hear very acutely and with comfort amid a great din, or noise. *2.* The disease causing the impairment of hearing, thus relieved, is situated in the middle ear. *3.* If a physicist can give us an instrument, which being placed in the auditory canal, would produce sound enough to act upon the ossicles, as does a great noise in a room, or the noise of a railway train, we shall have found magnifying lenses for the deaf."

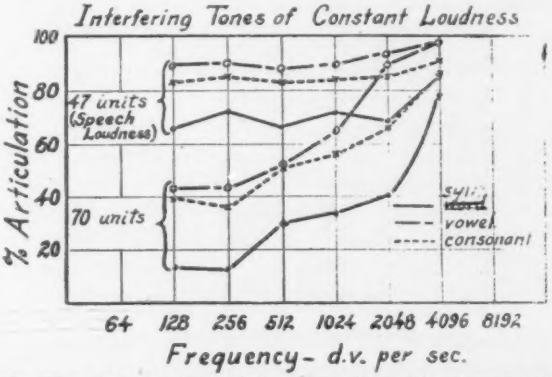


Fig. 39. This chart is obtained from Fig. 38, but is plotted differently. These curves show that low tones produce a greater interfering effect upon speech, and that the interfering effect becomes less and less for higher pitched tones.

Von Tröltsch[38] reasoned that a paracusic, because of his conductive impairment, was not disturbed by the noise, whereas the normal was much disturbed by the noise and consequently spoke louder.

Dr. E. E. Holt[22] questioned whether anyone actually did hear better in a noise, and stated that no careful investigation had been made to determine the question one way or the other.

Politzer states:[33] Löwenberg and Urbantschitsch attribute this phenomenon to an increased irritability of the acoustic nerve, brought about by a general concussion. The author (Politzer) is of the opinion, however, that this improvement in hearing during noises is due chiefly to a shaking up of the ossicles, whose joints have become rigid; these bones are thus thrown out of their equilibrium, and are thereby rendered more capable of transmitting the waves of sound.

It has already been shown that the terminations of the acoustic nerves are also simultaneously thrown out of their equilibrium, which causes them to become more easily excited by the waves of sound."

Sexton gives the following opinion:[13] "Increased hearing power in the midst of a noise. The very existence of this symptom has been contested by some, but that it does occur has been proved by tests, the validity of which, in the hands of competent observers, cannot well be questioned."

Ballenger gives the following as his explanation of paracusis:[2] "In the presence of any heavy vibrations, as in riding on the cars, the endolymph is thrown into motion, which is permitted by the elastic membrane of the round window, so that artificially a mass

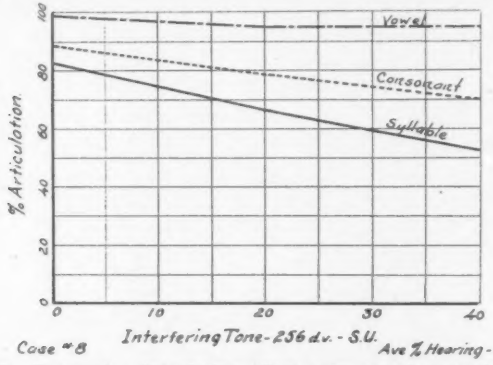


Fig. 40. Paracusis. Interfering effect upon speech reception of a tone of 256 d.v. There is a gradual diminution as the loudness of the tone is increased.

motion is produced similar to the normal motion of the endolymph and the nerve terminations become more capable of responding to the normal stimuli of molecular vibrations. . . . The vibration of the cranial bones and the stimulation of the nervous apparatus and fluid content of the labyrinth and cerebrospinal spaces, seem to the author to be the most rational explanation."

H. Burger made tests upon a patient in 1916[11] under the four following conditions: *1*. In a quiet place. *2*. In the midst of a noise. *3*. In a quiet place with the body of the patient in continual motion. *4*. On a railway train. He found that the whispered voice could be heard at a greater distance in the quiet than in the noise on a railway train, and that the patient could not hear a tuning fork for as long a duration as he could in a quiet place. From the tests given to the patient in the lobby of a railway station, when trains

were passing and when there were none passing, Burger concludes that a slight noise favors the hearing, but too much noise does not.

Albert A. Gray is clear and emphatic in his view on this subject:[19] "Some authorities deny the real existence of the phenomenon, and attribute the apparent improvement in hearing to the fact that in a noise the speaker instinctively raises his voice. But this is in reality no explanation, since it is only a limited number of deaf individuals who experience the condition, and many hear much worse if conversation is carried on in the midst of a noise. It is, besides, far too obvious to be explained away in all cases, and finally, not only is the voice heard better in a noise, but other sounds of constant intensity may be heard better under these conditions. . . . The view that a loud noise shakes the ossicles loose to a certain

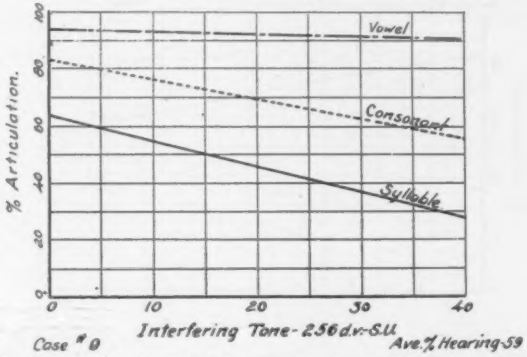


Fig. 41. Paracusic. Interfering effect upon speech of a tone of 256 d.v.

extent, and thus enables them to transmit the finer vibrations, which in the absence of a louder noise they are unable to do, may, in a sense, be said to be correct." Gray proceeds to explain paracusis as follows: He states that two conditions are requisite for the phenomenon of paracusis: "*1.* That the inhibiting mechanism (affecting the mobility of the ossicles) is massive, and *2.* that its degree of elasticity is comparatively high." He infers that a noise would be similar to a note of low frequency which would cause the ossicles to vibrate with a large amplitude. This motion of the ossicles would be similar to the motion of a simple pendulum. At the extreme displacement of the pendulum, it comes to complete rest and then reverses the direction of its motion. Its motion is then accelerated until it reaches its maximal velocity, just as the pendulum passes through its normal equilibrium position. Like the pendulum, the ossicles similarly are at rest in their positions of extreme displace-

ment, and are set into their maximal velocity as they pass through their normal equilibrium position. He infers, therefore, that while the ossicles are in motion they offer less resistance to the smaller and more frequent speech vibrations than they would if they were at rest. (This explanation of Gray, however, is not consistent with the law of addition of simple harmonic motions. When two simple harmonic motions are superimposed upon the same vibratory system, the two motions, to be sure, add up; but there is no amplification of either of the two component vibrations). In an article on "Otosclerosis," Gray states:[20] "The explanation of the occurrence of paracusis is still to seek. As is the case in regard to tinnitus, so also with paracusis; there has been much speculation but little observation of new facts. No doubt this is in large part due to the inherent difficul-

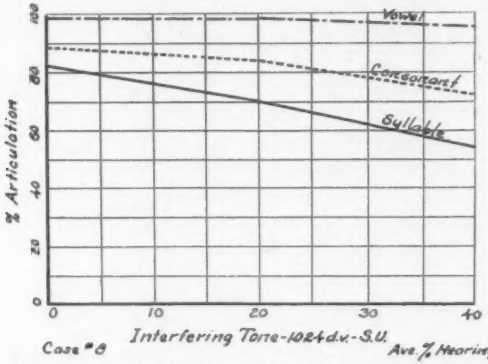


Fig. 42. Paracusic. Interfering effect upon speech of a tone of 1024 d.v.

ties of investigation. The present writer ventures to suggest that these difficulties will remain until we are in possession of a much greater knowledge of nerve physiology than we have at present."

Nuvoli constructed an ingenious mechanical apparatus for the "Experimental Reproduction and Mechanical Explanation of Willis' Paracusia."[31] His conclusions may be translated and abstracted somewhat as follows: The conduction of sound waves of slight intensity is more difficult in the silence than in the noise of a great city or a moving train, because, when the sound waves are intense enough to have already overcome the inertia of the tympanic apparatus and have set it to vibrating, to this may be added the vibration of slight sounds, which could not alone have overcome the inertia and would have been reflected, but which, in the presence of the noise, are not only heard, but produce sensations as distinct as if they were the only vibrations received.

Fraser mentions that[16] "Jenkins and others hold that paracusis is more apparent than real, that it is due to the fact that extraneous noises, like those in a train or street car, which are low in pitch, do not disturb an otosclerotic so much as a normal-hearing person, and that, therefore, the otosclerotic gets more advantage from the raising of his friend's voice, which always occurs under such conditions."

Kranz has tested the hearing of a paracusic in the presence of a tone of 120 d.v. By speaking to the patient in a monotone, while the patient was listening to this tone, he found that the patient heard no better in the presence of this disturbance than in the quiet. He varied the intensity of the disturbing tone by holding the receiver at different distances from the ears of the patient. He also conducted this disturbing tone to the patient with the use of a special bone conducting receiver. He concludes that in no instance was

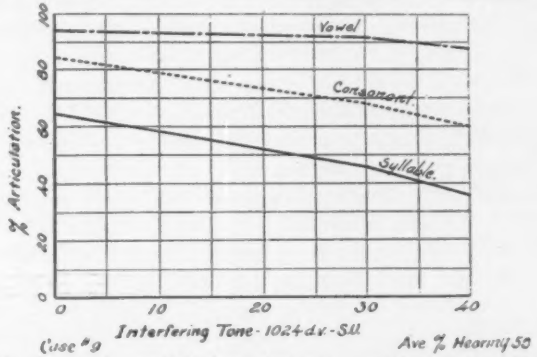


Fig. 13. Paracusic. Interfering effect upon speech of a tone of 1024 d.v.

the patient benefited by the presence of this disturbing tone. Kranz is of the opinion that "the determining factor in the ability of some deaf persons to converse better in a noise than otherwise is undoubtedly the increased loudness with which the normal person talks in the presence of a noise."[27]

Fletcher considers[14] that paracusis is what one would expect as a natural consequence of anyone having a conductive hearing impairment. He states that a person with 80 per cent of normal hearing in a room having average noise conditions, is on a par with a person having 100 per cent hearing; and that because of the noise, the person with normal hearing can just barely hear sounds which also are just barely audible to the person with conductive impairment. In other words, the person with normal hearing suffers an interfering effect from the noise, whereas the individual with con-

ductive impairment either does not hear the noise or, if he does hear the noise, hears it with greatly reduced intensity. He further points out that the noise in a subway train is sufficient to place an individual with about 50 per cent of normal hearing on a par with a person having normal hearing.

G. W. Boot comments[9] upon Fletcher's explanation: "The truth of the matter is that people who are deaf because of fixation of the headplate of the stapes, often do hear better in noisy places, as every otologist knows."

The following typical statement,[4] expressing the patient's point of view, is given by a paracusic: "On frequent occasions, when traveling in a Pullman car, I have heard whispers, never intended for my ears, on the part of people in neighboring seats, which at ordinary times would have been well below my perceptive horizon, but now embarrass me by the distinctness of the words. In such a situation ordinary conversation is understood by me with the utmost ease, and I frequently find myself forced to request my seatmate to reduce his voice, while he is just as apt to be asking me to elevate mine. During intervals when the train comes to rest, the conversation becomes immediately unintelligible to me and is best held in abeyance until the train starts again."

A. Logan Turner shares the general concept that paracusis is an anomaly:[40] "Certain anomalies of hearing sometimes accompany the deafness; thus, especially in cases of middle ear deafness, the patient may hear much better in a noise."

The above outline of the literature on the subject of paracusis serves to show the diversity of observation and opinion among those who have considered this phenomenon. The main impression that one gets from a survey of the literature is that there has been a large amount of speculation, but a meager amount of experiment. In fact, the only experimental work we know of is that just outlined, of Nuvoli, of Burger, and of Kranz. With the exception of Holt, Burger, Jenkins, Kranz and Fletcher, the authors have evidently regarded paracusis as a fact. It has been more or less taken for granted that these individuals do hear better in a noise; the main effort has been to work out ingenious explanations in order to put paracusis on a satisfactory physical basis.

Incidentally there is another impression that one gets from reading the literature on paracusis, which is of peculiar interest to the clinical otologist. Apparently the main significance that has been given to paracusis is expressed in terms of its significance in diagnosis and prognosis. The presence of paracusis in any given patient has been regarded as indicating that a pathologic change is far

advanced. Most of the writers consider that it is found in cases of conductive lesion. Both of these observations appear to be true. As regards prognosis, however, there appears to have been a delightful optimism which is no longer felt by otologists. The attitude used to be that if a patient exhibited paracusis, it would probably not be possible to restore his hearing.

The inference that one gets in reading these statements is that if an individual did not have paracusis there would be no particular difficulty in restoring his hearing. The present viewpoint appears to be quite different. This is no doubt due to the present tendency to rely more upon precise measurements than upon the enthusiastic statements of certain optimistic patients. Nowadays it is a rare experience for one to observe any marked improvement in the hearing in any chronically deaf patient, whether he has paracusis or not. To be sure, even today there are certain methods of treatment, some of which are no doubt enthusiastically believed in by those that are using them. However, we do not know of any such treatment, which has been proven to be valuable by precise quantitative tests of hearing, made before and after the treatment.

The results of our observations and experiments lead to the following conclusions:

1. Paracusis is found only in the individual with a hearing impairment of conductive type. This conductive lesion is usually of a rather marked degree. It seems that unless the conductive lesion is well advanced, the phenomenon of paracusis does not appear. Paracusis seems to be the natural consequence of bilateral conductive lesion, as anticipated by Fletcher. The degree of paracusis was found to be in proportion to the degree of the conductive lesion.

2. A noise impairs the hearing of everybody, irrespective of the degree of hearing or the nature of the hearing defect. This was found to apply to the hearing of pure tones, as well as to the hearing of conversation. In all of the tests the same result was obtained—the greater the noise the less the hearing. It is of particular interest that the paracusic exhibits no physiologic peculiarities. On the contrary, the evidence indicates that his auditory mechanism conforms to the usual concepts of auditory function. Therefore, it is not necessary to burden the hearing mechanism of the paracusic with a special and peculiar physiology. In view of this, there is little wonder that the many attempts to explain the peculiar phenomenon have not been in agreement with the basic principles of the mechanics of harmonic motion. It is not necessary to postulate that the gross vibrations, produced by a noise, render the ear more sensitive to smaller vibrations—or to make any other attempted explanation,

for the simple reason that the individual actually does not hear better in the presence of a noise. It is not necessary to attempt to explain why these individuals hear better, because they actually do not hear better.

The question of paracusis, therefore, seemingly presents a paradox. The paracusic patient is himself convinced that he can hear better in a noisy place; his acquaintances all notice that he appears to hear better in a noisy place; certain of the above tests have shown that he does enjoy a peculiar advantage when conversing with normals or individuals with perceptive deafness, in the presence of a noise. In recognition of this the writers advised one paracusic as follows: The patient, who is a druggist, had his office in the rear of his store in a very quiet location; he moved his office to the front of the store, which faced the street in one of the noisiest parts of the city; he now has much less difficulty in conversing with his customers. There appears to be no question that the paracusic does enjoy a relative advantage.

The following facts explain this seeming paradox:

1. The noise is not so disturbing to the paracusic as it is to all other individuals. In other words, an individual with a conductive impairment of sufficient degree to give him paracusis is less disturbed by a noise than any other type of individual. The conductive type of hearing impairment is characterized by a much greater loss of acuity for the low frequencies than for the high frequencies. This is consistent with the auditory masking of tones as demonstrated by Fletcher, Wegel and Lane.[42]

It is possible completely to obliterate the hearing for higher tones, although if the lower tones are stopped these higher tones can be plainly heard. One of the writers has shown that,[29] in a similar way, low-pitched tones exert a greater masking effect upon speech than do high-pitched tones. For example, tones of 128 d.v., or 256 d.v., or 512 d.v., if sufficiently loud will completely obliterate speech. In contrast, tones of high pitch produce only a very slight masking effect upon speech. For example, a tone of 2048 d.v., even of very great loudness, produces a very small masking effect, and a tone of 4096 d.v. produces practically no masking effect at all.

Again, the paracusic has greater acuity for the medium-pitched frequencies, than for the low-pitched frequencies. Good hearing for these medium frequencies is more important for the hearing of speech than good hearing for the lower tones. Therefore, the paracusic has relatively good hearing for those frequencies which are most important for the hearing of speech. Average speech lies within the frequency range of 60 to 6000 d.v. The work of Fletch-

er shows that those frequencies in the range of 1500 d.v. are the most important for the hearing of speech. Those important frequencies of speech which determine its intelligibility lie within the range of about 1000 d.v. to 2000 d.v. To the extent of our clinical experience, the paracusic appears to exhibit relatively good acuity within this particular range, as shown by the hearing charts. All of the paracusics we have seen have shown poor acuity up to an average of about 512 d.v. Above this frequency, their hearing improved to about 2000 d.v. or 3000 d.v. From this point up they have varied greatly, some of them continuing up to the normal upper pitch limit of hearing, where others cease to hear above 5000 d.v. or 6000 d.v.

The above considerations explain why it would be expected that a paracusic would enjoy a relative advantage in the presence of a noise. Although ordinary noise is made up of frequencies throughout the entire audible range, yet a considerable portion of the energy of the noise lies in the frequency range below 512 d.v. As a paracusic hears very poorly these tones below 512 d.v., he is relatively less disturbed by them. Again, it is these particularly low frequencies that produce the greatest masking effect for speech, as shown above. A noise, therefore, does not mask the speech so much for the paracusic as for the normal.

There is another factor, which, in the presence of an excessively loud noise also acts in favor of the paracusic. If the noise is so loud that the conversation must be maintained at a loudness of more than eighty sensation units, the very loudness of this conversation introduces a distortion for the normal, but not for the paracusic. Because of the conductive impairment of the paracusic, the conversation and the noise are both correspondingly reduced in loudness and may not be louder than about forty sensation units, when it actually reaches the cochlea. Because of the nonlinear response of the ear, the very loud sounds of the conversation, as well as of the noise, introduce a distortion.

Incidentally, in contrast to those who have conductive hearing impairments, persons with perceptive impairment claim they hear less well in the presence of a noise than in the quiet. Many of our observations upon individuals having perceptive impairment confirm this claim. It is well established that individuals with nerve deafness suffer a much greater loss of acuity for the high-pitched tones than for the low-pitched tones. Further, the defect is one of the perceptive apparatus and not of the transmitting mechanism. Since they have good acuity for the low tones, they experience the full detriment of the masking effect of low tones.

2. Obviously the paracusic enjoys an additional advantage when he is conversing with a normal or an individual with perceptive deafness, in the presence of a noise. The normal individual always speaks louder in the presence of a noise because he hears the noise. He is conscious of the noise and attempts to speak above this noise. The tests we have conducted confirm this. When conducting speech tests, the noise being produced by the loud-speaker, the caller notices that he is speaking very loudly when the noise is suddenly stopped. This was confirmed by repeated observations throughout the progress of the tests. The paracusic, on the contrary, does not hear the noise very well and yet he hears his own voice abnormally well because of his conductive lesion. For this reason the paracusic does not speak loudly in the presence of a noise. Therefore, the paracusic is getting the benefit of the louder speech, spoken by the normal individual, whereas the normal individual is attempting to hear the much feebler speech of the paracusic. This contributes greatly to the relative advantage enjoyed by the paracusic.

SUMMARY.

1. The results of experiments show that the paracusic does not hear better in the presence of a noise. He hears less well in the presence of a slight noise and his hearing is more and more interfered with as the loudness of the noise is increased. The evidence indicates that all individuals hear better in the quiet than in the presence of a noise.

2. The paracusic has a relative advantage over the normal, or over the individual with perceptive deafness, in the presence of a noise.

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A CASE OF DEVELOPMENTAL DEFORMITY OF THE NOSE CORRECTED BY BONE AND CARTILAGE TRANSPLANTS.*

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This case is reported, not because it has any great dramatic value on account of the marked change in the nose after the correction of the deformity; its chief interest lies in the fact that it was one of those cases of developmental deformity that may be described as being due to a disarrangement of the forces which under usual and normal conditions will produce a symmetrical nose. In these cases the disarrangement may apply to either the intensity or the direction

of the developmental forces. The deformity may be embryonic in origin or it may be traumatic, the injury having occurred in early childhood before the developmental forces have expended themselves.

This young man sustained an injury when about two years of age, involving the cartilaginous part of the septum. When I first saw him he had no cartilage in his septum and there was a great depression below the ends of the nasal bones, which had existed for a number of years. The problem in a case of this kind is to raise

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the bridge and tip of the nose and to replace the parts that have been destroyed. In this instance, a cast was made; you will note the marked falling of the nose from the end of the nasal bones and depression of the tip. There was no support whatever where the cartilaginous septum should begin, so that in the development of the nose the young man was without the influence of the septum. Through the septum the most important of all the developmental forces is applied, namely, those necessary to raise the bridge. The growth of the vomer is the chief factor in elevating the flattened bridge of the infantile nose into the more prominent position which it occupies in the adult.

The primitive septum is formed by the vomerine cartilage. This, however, is an embryonal structure, and only the anterior part persists as the cartilaginous septum in the adult. The vomer is formed from two ossific centers which make their appearance posteriorly in the membrane which covers each side of this cartilage. These ossific centers make their appearance at about the eighth week of fetal life, and as they develop, they form two plates of bone, which gradually unite from behind forwards; the vomerine cartilage being absorbed and also pushed forward as this process goes on. The plates of the vomer do not become completely united until the fifteenth year and this period usually coincides with the full development of the nose. If these plates fail to unite, there will be a sulcus between the two nasal cavities; a deformity familiarly known as wolf-nose.

Destruction of the vomer either by traumatism or disease before the developmental period is complete, will result in the nose retaining its infantile type.

In the case which I present, I corrected the deformity by transplanting a portion of the patient's eighth rib. I used the entire thickness of the rib with the exception of the inner compact layer. The portion used was covered with periosteum. I introduced it from within the vestibule of the nose and mortised it into the frontal bone, just above the nasofrontal process. As there was no septum, I made one from costal cartilage and introduced it between the layers of mucous membrane of the septum, making the incision at the margin of the columnar cartilage on the left side. All of this work was done from within the nose and you will note that no scar remains.

This operation was done on Dec. 28, 1925. The patient was in the hospital six days. You will note that the upper end of the transplant is firmly united to the frontal bone already.

No. 24 East 48th Street.

HEMATOMA OF THE SOFT TISSUES OF THE THROAT, NECESSITATING TRACHEOTOMY. A TONSILLECTOMY COMPLICATION.

DR. LEROY A. SCHALL, Boston.

Ecchymoses of the tonsillar pillars, soft palate and uvula, following a clean and careful tonsillectomy is a frequent but minor complication. However, a profuse infiltration of blood into the soft structures, with the formation of a hematoma of sufficient size to cause asphyxia, is of sufficient rarity to warrant a single case report.

W. J. C., white, age 29 years. Referred to the United States Veterans' Hospital No. 36, Parker Hill, Boston, Jan. 13, 1921, by Dr. H. B. C. Riemer. Diagnosis: Iritis, O.S. The past history was negative except for an iritis following mustard gassing in 1918. Throat examination showed buried tonsils from which liquid pus could be expressed. The anterior tonsillar pillars were markedly injected, and the anterior cervical glands were enlarged.

Blood Wassermann was negative. Coagulation time (capillary tube) was 3 minutes.

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Feb. 1, 1921: Tonsillectomy was performed by the dissection and snare method under local anesthesia, using 11 c.c. of 0.5 per cent solution of novocain. The tonsils were dissected clean, leaving smooth fossae. There was no exposed vessel or tear of the muscle fascia.

Two hours after operation there was considerable bleeding from the left fossa, which was controlled by local applications. One-half hour later the bleeding recurred with clot formation and ecchymosis of the anterior pillar. Upon removal of the clot, as no localized point of hemorrhage could be found, it was decided to give a general anesthetic. With the patient on the operating table, the anesthetist started to give nitrous-oxide-oxygen preliminary to ether vapor. After several respirations the breathing stopped, the patient became deeply cyanosed with the jaws tightly locked. The house officer, Dr. Holland, attempted artificial respiration, and, upon failure to open the jaws, the writer performed a tracheotomy. Even with the trachea open it required oxygen and artificial respiration to re-establish breathing.

Relaxation was secured by giving ether vapor through the tracheotomy tube. Examination revealed a large swelling of the soft tissues, including the soft palate, which completely occluded the oropharynx. The tissues were so distended and discolored that the former tonsillar fossa could not be recognized. An attempt to aspirate failed. An intravenous injection of 2 c.c. of thromboplastin was given and the patient returned to the ward. Subsequently, the swelling quickly subsided, the tracheotomy tube was removed in two days, the neck incision healed and the throat presented the picture of a successful tonsillectomy, with separated intact pillars and smooth fossae.

It is reasonable to suppose that a vessel either retracted beneath the muscle fascia or ran so close to the tonsillar bed that its coat was injured, with subsequent bleeding, when the effects of the local anesthesia wore away. The nitrous-oxide-oxygen anesthesia evidently caused sufficient rise of blood pressure to widely open the vessel, permitting rapid bleeding into the musculature.

520 Commonwealth Avenue.

OSTEOMA OF THE FRONTAL SINUS WITHOUT EXTERNAL MANIFESTATION. REPORT OF A CASE.

DR. HAROLD I. LILLIE and DR. CARL M. ANDERSON,
Rochester, Minn.

Osteomas which involve the frontal sinus and produce symptoms but no external manifestation are not frequently encountered. Osteomas arising in other paranasal sinuses and extending into neighboring structures are more frequent. In 1918 Sewall collected ninety-two cases from the literature and added one of his own. We have been able to find fifteen additional reports of cases.[1-15] However, in the vast majority of the reported cases there was some external manifestation of the presence of the osteoma.

Osteoma is a true bone tumor essentially benign in nature, frequently multiple, usually developing from the bone or periosteum, though it is possible for it to develop in the soft parts. Metastasis never takes place. According to McArthur, the paranasal sinuses and the middle ear and mastoid seem to be the most frequent sites for independent bony growths. Osteoma may arise from osteoblasts outside of bony tissue, in which case it will have no periosteum. In the paranasal sinuses bony tumors are encountered lying free, that is, without attachments, although according to some observers, if careful search is made, some roughness of the bone may be found, to which it is highly probable the osteoma was originally attached.

Osteoma must not be confused with exostosis due to frequent repeated inflammatory insults or to exostosis arising within the bone for the same reason. No perfectly satisfactory explanation has been given for the occurrence of true osteoma. Osteomas are divided into two main groups, those of loose texture, consisting of spongy bone (osteoma spongiosum) and those hard and dense as ivory (osteoma eburneum). The difference in these forms lies chiefly in the varying size and the number of the vascular and medullary spaces. As a rule the growth of the tumor is slow.

SYMPTOMS AND DIAGNOSIS.

Symptoms or signs of osteoma may be entirely lacking unless the osteoma has developed rapidly and is confined in so small a space

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Figs. 1 and 2. Skull showing shadow within the left frontal sinus.

Figs. 3 and 4. Operative result.

as to produce pressure symptoms. If the osteoma arises externally, a slowly growing tumor may call the attention of the patient to the condition. Symptoms from some other cause, as in the reported case, may direct the physician's attention to the presence of the tumor. The diagnosis of osteoma is made accidentally, unless the tumor is of sufficient size to have broken through the frontal sinus, when it can be made directly. Sequestration of bone may present a somewhat similar picture, although usually the shadow is not so dense or so well defined and there is no antecedent history of injury or suppuration. Bismuth paste within the frontal sinus may cause a shadow similar to osteoma, but the history will aid in the diagnosis.

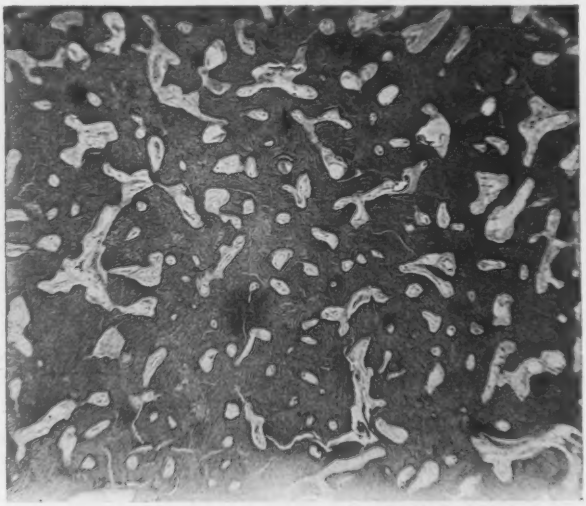

Fig. 5. Osteoma, low power.

REPORT OF A CASE.

In 1922 a patient was encountered complaining of swelling, redness and pain over the left supraorbital region and extending to the lateral nasal wall throughout the region of the inner canthus. The symptoms had been present for a few days and had been preceded by acute upper respiratory infection. Careful intranasal inspection under favorable conditions did not reveal any evidence of sinusitis or dacryocystitis. A roentgenogram revealed a circumscribed, well defined shadow within the frontal sinus on the left side, surrounded by clear areas to the limit of the sinus (Figs. 1 and 2). Under local measures the acute inflammation subsided promptly. A diagnosis

was made of osteoma of the frontal sinus. There were no further symptoms until 1925, when a constant distress or heaviness, increasing in severity, began to annoy the patient. Intranasal and external inspections were negative. The roentgenograms demonstrated that the osteoma had increased in extent greatly. Radical operation for the removal of the osteoma was decided on.

Exposure of the osteoma was made by the extensive removal of the paper-thin outer table to the limits of the frontal sinus (Figs. 3 and 4). The tumor was hard and smooth and conformed exactly to the shape of the sinus. It appeared to be firmly fixed. Removal was effected by chiseling small pieces off the mass. The inner table of

Fig. 6. Osteoma, high power.

the frontal sinus was found to be as thin as paper and it was therefore necessary to use extreme care not to break it. The inner table was separated from the tumor by very thin mucous membrane. That portion of frontal sinus not filled with the tumor contained sticky mucus. The mass extended into the fronto-ethmoid cells on the left and at this point it became movable. The outermost part of the tumor was cancellous, gradually becoming more dense as the attachment was approached. Further exploration showed that the tumor arose from the suture between the frontal and nasal bones and could be removed completely. The operation was completed by enlarging the nasofrontal ducts for drainage.

The histopathologic description of the specimen removed at operation was as follows: The tumor consists of an encapsulated nodular ivory-like mass, composed of firm, dense, calcareous tissue. The histologic examination reveals well developed Haversian systems, which are irregular in form and arrangement. The Haversian canals are larger than those found in normal bone. They contain varying amounts of connective tissue. Both in and between the lamellae are small, irregularly-shaped groups of lacunae connected by ill-defined canaliculi (Figs. 5 and 6).

The sense of fullness was relieved and the convalescence progressed without incident.

COMMENT.

We do not believe that the acute inflammatory condition had any relation to the presence of osteoma. The rapid subsidence of the redness and swelling without evidence of suppuration suggests that there was no relation. The acute symptoms occasioned the roentgenographic examination. The roentgenogram was confusing to the physician in charge. It would be difficult to explain how a suppurative process involving the frontal sinus would produce a shadow so dense and so well defined and still not involve the entire frontal sinus. It might be suggested that operation was indicated at the time the patient was originally observed. However, it was felt that it would be preferable to observe the patient for some time and follow the development by roentgenographic films, for removal of the osteoma was not warranted in the absence of symptoms. No further symptoms appeared for two years. The osteoma was found to have increased in size greatly and it was then decided that radical removal was indicated. Had the patient been seen in the interim, operation might have been advised sooner.

No particularly new or original observation is here recorded, unless it is the site of origin of the tumor and the fact that it could be completely removed.

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Mayo Clinic.

THE USE OF OPAQUE SUBSTANCES TO LOCALIZE A LUNG ABSCESS.*

DR. E. J. RYAN, New York.

Many substances have been used in an attempt to outline abscess and bronchiectatic cavities in the lungs. These substances must of necessity be opaque to the X-ray; in addition they must be non-irritating, non-toxic, and preferably substances that will be gotten rid of rapidly.

The ones most used have been *a.* the salts of bismuth, either as a powder insufflation, or *b.* suspended in some medium, the most common being olive oil. More recently the iodin in oil preparations have found favor and are at the present time most widely used.

1. In bismuth insufflation of the lungs we have been most unsuccessful, the dry powder only outlining the main branches into which it is blown for a short distance, and outlining cavities very imperfectly when compared with the fluid media.

2. The bismuth in oil, which is usually a 40 per cent mixture, has been found to work out excellently. It is easily prepared and will keep indefinitely. It is sufficiently fluid to find its way into the small bronchi, and the smallest amount is enough to give a sharply

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defined shadow on the X-ray films. It is nonirritating and usually the patient will cough it all up after the films have been taken. Occasionally some of it remains in the lung for a considerable length of time. One case we had showed a shadow six months after the instillation. It gradually disappeared, however, and the patient at no time showed any ill effects from its presence.

More recently the introduction of the iodin in oil preparations by Sicard Forestier in France has quickened interest in this work. These solutions are probably the best and most readily adapted for this work. Due to the high atomic weight of the iodin, and its strong concentration in the solution, they cast dense shadows in small amounts. They are more fluid than the suspension of bismuth in oil, and therefore more searching in the smaller bronchi and into cavities where the lumen of a bronchus is narrowed by inflammatory thickening of the mucous membrane.

The iodin method first used to outline the bronchial tree was to pass a catheter into the trachea and instill the medium through this and by placing the patient on either side have the fluid run into the area desired.

When lipiodol was first introduced it was instilled by means of a canula which was pushed into the trachea from in front. This was quickly discarded as it seemed to be an unnecessarily radical form of procedure for an examination of this kind, and also added the danger of infection if not carried out with proper surgical technique.

Instillation through the bronchoscope has been found to give the best results, and with the use of a flexible tipped canula it can be introduced into the bronchus supplying the area affected; and with the patient in a position which tends to keep the medium there while films can be taken.

A more recent method and one which has been found to be the most useful by many, is the instillation of the medium through the bronchoscope while the patient is under the fluoroscope. With this procedure it can be watched as it enters the bronchi, and much useful information can be obtained as to the location of cavities and the bronchus leading to them.

The best position for taking films can be seen, and at any time the instillation can be stopped and small films taken of a particular part.

112 East 77th Street.

PEMPHIGUS OF THE MOUTH AND PHARYNX.

DR. C. CALVIN FOX, Philadelphia.

The name pemphigus, meaning "blister," is derived from the terminology of ancient Greek medicine. Hippocrates mentioned "the dreadful appearance of the febres pemphigodes." The modern spelling was first used about 1725 by Sauvages. In 1787, Dr. Dickson reported, to the Royal Irish Academy, a case with lesions on the tongue and cheek.

From as many as ninety-seven former varieties of pemphigus, the present day dermatologist recognizes four types:

1. Pemphigus acutus. *2.* Pemphigus chronicus or vulgaris. *3.* Pemphigus foliaceus. *4.* Pemphigus vegetans.

Pemphigus acutus runs a rapidly fatal course very similar to "foot and mouth disease," and suggestively often the patients have been in contact with cattle or animal products.

Pemphigus foliaceus undermines the skin, whereas in pemphigus vegetans the lesions are elevated. Both are rare types.

Pemphigus chronicus, also called pemphigus vulgaris, is the type referred to when the term pemphigus is used without qualification. It is the type most often encountered on the skin and mucous membranes. There came to my notice no definite case reports of any but the chronic type appearing primarily on mucous membranes. Therefore this article will deal with pemphigus chronicus, or vulgaris, primary in the mouth and pharynx.

The meager literature on this subject deals largely with the skin lesions from the dermatologist's viewpoint. It is our purpose to devote the greatest attention to the disease as seen by the laryngologist. By him pemphigus primary in the mouth and pharynx can be defined as an acute or chronic bullous disease, characterized by the formation of variously sized white blebs that quickly collapse to form a foul, yellow membrane over a slightly inflamed, raw mucous membrane surface. The disease is identical to the pemphigus chronicus of the skin, differing only in that the site of the initial lesions are on the mucous membranes. Literature cites only rarely a case primary to the buccal or pharyngeal structures.

The objective symptoms are fairly constant. Due to heat, moisture and trauma being constantly applied to the bullae, their thin

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epithelial cover ruptures very quickly after formation and present to the examiner a yellow membrane, soon surrounded by a narrow zone of low grade inflammation due to secondary infection. The initial lesions usually are found on the gums and resemble very closely the familiar "canker sore." Only a few bullae may be present for some days or weeks. These run their course and heal after several days, to be soon followed by a few more similar lesions. Sooner or later these lesions become general, coalesce and include large areas of the mucous membranes. By this time there is a striking increase in the flow of a thin, clear, watery saliva. Most often the first extensions are along the labial surfaces of the alveolae and gingival margins. The early appearance is that of Vincent's angina, or trench mouth. The surface is irregularly covered by the whitened membranes of fallen bullae roofs that have quickly acquired a secondary infection which makes them yellow, thick and possessed of a very repulsive putrid odor. The surface is easily detached and bleeds with even slight manipulation. The membrane soon becomes loose at its margins, leaving a dull red surface. Due to the fact that several lesions are included in each patch of membrane, the denuded edges have an irregular serpiginous outline. At the outer edge of these denuded red margins can often be seen very small fissures extending into the healthy mucous membrane. These fissures become secondarily infected, along with the bullae floors, and account for the presence of rather deep ulceration of some areas.

Ordinarily the lesions next progress to the inner surfaces of the cheeks, where the teeth traumatize and aggravate the condition. The parotid duct may become infected and the ostium swollen shut, so that an alarming distention of the parotid gland results from the retention of its secretion. Soon the tongue and sublingual structures are covered by the membrane with only the tip and margins of the tongue remaining clean. The tongue swells, as does the sublingual gland, making the use of the tongue depressor objectionably painful and invariably certain to cause capillary oozing. As the condition extends there is redness and swelling of the tonsils and peritonsillar structures sufficient to at times stimulate a peritonsillar abcess. A membranous lesion appears on one or both tonsils. The palatine arches, soft palate and uvula swell greatly as their surfaces change from dull red to yellow. When the pharynx becomes involved, lesions difficult to reach sometimes appear at the base of the tongue or tonsils. The patient complains greatly of a painful throat and swallowing is an agony. Even with such extensive in-

volvement there is surprisingly little adenitis. When lesions develop in the larynx there is hoarseness or loss of voice. The case to be presented had such a condition. Weber[1] reported a similar case in 1924.

Part or all of the mucous membrane surface of the mouth and throat may become involved in a very short time and remain constantly involved by the reformation of new bullae on the old bases. The condition will repeatedly improve in one place and be aggravated elsewhere, over a period of time ranging from several weeks to many months.

The early subjective symptoms are itching and mild burning soreness, just as when any blister is broken and the raw surface exposed to trauma or irritants. Salivation is early and profuse enough to be complained about.

The patient becomes depressed, nervous, apprehensive and sensitive, largely due to the unyielding, annoying and offensive nature of the disease. Insomnia is a natural result of the nervous condition and recedes as the patient becomes more reconciled to his condition and less acutely nervous. The patient with a very sore mouth, tongue and throat can take only liquid and soft foods in small amounts. The anorexia so commonly described depends somewhat on the pain involved in the taking of food. The loss of weight and strength accompanies the decrease of nourishment taken. Temperature is seldom elevated more than one degree. Some authors describe vomiting and diarrhea as prominent symptoms. Since nearly all cases are given large doses of arsenicals it is possible that the intestinal disorder can be, in part, due to, or aggravated by, the medication. It should also be remembered that nervous irritability is a symptom of arsenical poisoning.

It is stated that the differential diagnosis of pemphigus cannot be positively made unless the skin lesions are found. It is therefore reassuring to note that, in all cases reported as not dying from some intercurrent disease, there has occurred the typical bulla as described by all dermatologists. It may be found at any time after the disease has made its appearance in the mouth. Pusey[2] states that the disease may be in the eyes, nose, vagina and, presumably, stomach. We have found no case report of lesions in the nose. The case that came to my notice developed bullae that involved the mucocutaneous junction of the anterior nares, and the conjunctiva was inflamed. On the skin the bullae are at first filled with clear fluid, which rapidly becomes turbid. A narrow red areola surrounds the bulla. If undisturbed, the turbid fluid exerts suf-

ficient pressure on the most dependent part of the membranous walls, to cause them to resemble the sagging of a partly filled water bag.

The fluid may be resorbed, but usually the bulla is ruptured and a secondary infection develops. A scab quickly forms, to remain until healing takes place or the lesion recurs. The skin eruption is attended with itching and a burning pain. The denuded surfaces are a source of considerable distress. The lips become swollen, infected, adhere, crack and bleed in a very annoying manner.

The etiology is still an unsolved medical problem. Many authors believe bacterial infection to be the cause. Eberson,[3] of the Mayo Clinic, claims to have found a gram positive, anerobic, nonmotile, coccoid or avoid organism in the blood of seven cases. It was found in all stages of the disease, was toxic in character and produced pemphigus when injected into rabbits and guinea pigs. Other observers think the cause to be a trophoneurosis and have demonstrated nerve changes. Covey[4] found trophic disturbances in the dorsal sensory tracts of the spinal cord and spinal ganglia. There were microscopic bodies in the dorsal cord. Strickler and Brown[5] found an increase of cells in the spinal fluid. A number of cases are reported as having spinal cord lesions, which gives some weight to the statement that shocks to the nervous system, such as fright, worry, fatigue or violent emotions might be the causative factor. We know that herpes zoster and tabes may have skin lesions in addition to the nerve involvements. If the nervous system is the etiologic factor the thought would arise that the disease should be more prevalent and be rapidly increasing in this age when nervous disorders are so commonly encountered. Then again it is quite possible that some micro-organism may be responsible for the nerve lesions and either through the nervous system, or directly, produce the skin and mucous membrane manifestations. Other observers have considered the ductless glands and faulty metabolism as causes. The multiplicity of ideas indicates our ignorance of the true cause.

The pathology of the bleb is best explained by assuming that there is an effusion of serum due to toxic paralysis and dilatation of superficial blood vessels. The nerve changes already described are mentioned by most pathologists, but admit of no solution.

Cultures from primary unruptured blebs are sterile. Later they are clouded by leucocytes. Secondary contamination is usually by staphylococci, although in the mouth the infection is a mixed one. In the case observed the mouth cultures showed spirillae of Vincent and pneumococci on one occasion and subsequently only staphylococci and pneumococci.

The prognosis is unfavorable. When the mucous membranes are markedly involved the result is practically always fatal. The severity of the secondary infection certainly adds to the gravity of the prognosis.

The treatment is supportive with concentrated liquid and soft foods. Intramuscular injections of arsenicals, such as the cocodylate, arsenites and the arsphenamines are always considered advisable. The subcutaneous administration of coagulen on alternate days is said to enhance the value of arsenical medication. Quinin, strychnin and iron are held in high favor. A mouth wash containing resorcin and myrrh is soothing. The skin lesions are made more comfortable by a lotion made to include resorcin.

SUMMARY.

Pemphigus beginning in the mouth and pharynx is a rare and usually fatal disease. It resembles other mouth and throat infections that the laryngologist treats.

Its final diagnosis is uncertain, if not impossible, without the presence of skin lesions.

The pathology does not prove the cause to be either infection or trophoneuritic.

The treatment is not specific; arsenic is at present the drug in greatest favor.

Case Report: The patient to be exhibited is an adult female, age over 40 years, married. Five of seven children are living and well. She is a painter of miniatures, and often pointed the tips of her brushes by moistening them in her mouth. She thus had remote contact with animal products.

She vaguely recalls having had two "gum boils" during July, 1925. They were given no attention. During August she had two more similar spots, which apparently healed. When I saw her on Sept. 14, 1925, while some dental work was being done, there was an inflammation of the gingival margins of several teeth on the right side of the lower jaw. There was a yellow, membranous lesion below the lower right canine tooth. This spot was treated with first 10 per cent then 2 per cent silver nitrate and antiseptic mouth washes, such as potassium chlorate. No history of lesions elsewhere could be obtained. In October the gums and cheeks were involved and the orifice of the left parotid duct was closed by swelling and infection. The parotid gland was greatly distended but quickly receded. Cultures showed an abundance of pneumo cocci and on one occasion spirillae. She was given Fowler's solution by mouth, mixed pneumococcic vaccine subcutaneously, a tonic

and local treatments. There was decided improvement and she ate Thanksgiving dinner with relish. The disease then spread to the tonsils, palate, tongue and sublingual regions so that swallowing was difficult. She was depressed, nervous, apprehensive and lost weight. Nausea made necessary the discontinuance of the arsenic. On Dec. 25 she went to bed because of exhaustion. On Jan 2, 1926, she had a chilly and pounding sensation beginning in the left arm, then extending to the throat, face and legs. The pulse was rapid and she was weak after the attack. On Jan. 5, Dr. Coates saw her and at that time she stated that during December there appeared on her right shoulder a small blister, which broke and became covered by a scab. She had not considered it of sufficient importance to mention at times when she had been asked about sores elsewhere than in the mouth and throat. When the discovery was made she was sent to Dr. Schamberg, who definitely established a diagnosis of pemphigus vulgaris. The lips were now swollen and the ulceration had extended to the vermilion border. The entire mouth cavity, pharynx, uvula, soft and hard palates were covered by the yellow membrane.

She was given sodium arsenite intramuscularly, alternating with coagulen (which is thought to enhance the value of arsenic medication).

The typical skin lesions have since extended to the face, hands, trunk and legs in the typical manner. The mouth condition has shown little tendency to improve. On Jan. 12, she became quite hoarse. The arytenoids were red and swollen for two days, after which time the voice improved.

The physical condition varied from one day to another, although the tendency is toward a gradual decline of vitality. At the latest examination the tongue was less swollen and contained less membrane.

The Wassermann, twice taken, is negative.

Blood cultures were negative.

The blood count of Jan. 18 showed 4,750,000 red cells, 12,560 white cells, 2 per cent eosinophiles and 90 per cent hemoglobin.

Cultures taken from unruptured bullae were negative.

Cultures from the mouth and throat have been negative for diphtheria, but show staphylococci and pneumococci.

Smears and cultures reported by Dr. Claude Brown, on Feb. 2, showed a gram negative bacillus, staphylococcus aureus, streptococcus viridans, streptococcus catarrhalis and many organisms of Vincent's angina. From the bullae he obtained staphylococci. These

findings do not reveal the etiologic factor, but they show the persistent recurrence of Vincent's angina and the presence of a very serious secondary infection that is itself very capable of causing death.

SUBSEQUENT AND FINAL REPORT.

The lesions gradually extended until the entire body was involved as one huge ulcerated surface having a most offensive odor. The patient failing to respond to any type of treatment applied, became very toxic, asthenic to the extreme and died Feb. 26, 1926, during the seventh month of the disease.

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350 South 16th Street.

PATIENT WHO CAN SPEAK, SING AND HUM, WITHOUT THE USE OF THE VOCAL CORDS.*

DR. P. MARIO MARAFIOTI, New York.

The patient was presented as a demonstration of the claim that the processes of speaking, singing and humming are possible without the co-operation of the vocal cords and that, contrary to prevailing opinions, the pitch of the voice can be produced by the vibrations generated in the different spaces above the larynx through their adjustment to larger or smaller dimensions, without the vibrations of the vocal cords. This claim was originally made by Dr. Marafioti in a book published in 1922.

The individual was a man of middle age who constantly wears an adult size intubation tube filling the entire larynx who cannot therefore in any way use the vocal cords, since not only does the tube press on the cords, but the air passing through it escapes

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above the vocal cords and the false cords and cannot, therefore, produce vibrations below that level. It was also pointed out that owing to the fact that the tube is much smaller than the trachea and laryngeal cavity, even the amount of breath which can pass through it is reduced to considerably less than the normal. Therefore, of the three powers which are claimed to produce voice, the first two—the breathing power and the vibrating power (namely, the lungs, the larynx and the vocal cords) are severely handicapped in their functions, the resonating power only remaining normal. Yet this individual, as the result of training, could, by the adjustments of the organs of articulation and the organs around the chambers of resonance, actually produce a voice distinct enough to make himself easily understood at a considerable range, and although he was not a singer he could sing phrases in which the voice was clear enough for anyone to understand the words and recognize the melody. He sang "La Donna é mobile" from "Rigoletto" and some phrases from "Lucia" and "Traviata," and hummed the American national anthem. Phonographic records of the patient, made by the Brunswick Company, were also presented.

In making this demonstration of pitch and articulation without the use of the vocal cords, the fact was emphasized that scientists should direct more attention to other organs of speech as factors in voice production, namely, to the organs of articulation and to the resonating chambers. Their adjustments, together with those of the different spaces of the vocal apparatus above the larynx, play a role in voice production and determination of pitch far greater than has been suspected. So far, all scientists and voice experts have allotted only to the vocal cords the power of determining pitch, and have considered the resonance chambers as merely a magnifying power. By this demonstration it was shown that this is evidently not true, for in the individual presented the voice and pitch were produced by the organs of articulation and the resonance chambers alone, thereby establishing the claim that the chambers of resonance create vibrations of their own which exercise some influence on the formation of the voice and pitch.

Dr. Beaman Douglass said that physiologists have for a long time assigned to the larynx part of the duty of respiration and part of the duty of phonation. Under phonation they have been inclined to give the entire value for change of pitch in the speaking and singing voice, exclusively to the vocal cords. Laryngologists in doing laryngectomies very soon found out that phonation was not alone one of the functions of the larynx and that patients without

a larynx could articulate; but apparently no one has ever claimed that the larynx was not the sole producer of pitch. Pitch is demonstrated in singing (which is a musical rhythmic change of pitch with articulation), and in humming (which is a musical rhythmic change of pitch without articulation); but in both of these cases the principle thing is the change of pitch, and so far as known no one has ever claimed that a change of pitch could be produced without using the vocal cords. If that is so, this case is an epoch-making one. This man which we have presented is not a Caruso and will never be an operatic tenor, but you have heard him sing and change his pitch so that all can hear that change of pitch clearly, and yet he cannot use his vocal cords. He has worn an intubation tube for a number of years and the cords, both true and false, have been pressed and held widely apart so that they cannot functionate at all.

This work is a development of Dr. Marafioti's, who was formerly one of my assistants and left the clinic to do cultural work in singing. Some years ago he published a book announcing this theory, but was not able to prove his theory that voice pitch could be produced without using the larynx. He interested me in this theory, but I combatted it on the basis of the old belief which I too held, that pitch could not be formed without the vocal cords. I am sure you will agree with me that this is a very remarkable demonstration of articulation and singing without the use of the vocal cords and I am sure you will all agree with me that it may be revolutionary in its effects.

7th Avenue and 55th Street.

REPORTING A FOREIGN BODY CASE OF UNUSUAL INTEREST.

DR. MORRIS E. NEWMAN, Buffalo, N. Y.

The reporting of this very interesting foreign body case attracts the attention of both the general practitioner and the specialist. It brings out the value of careful early physical examination following postoperative reactions and the importance of exacting X-ray interpretations.

Too many of these types of chest cases are passed up as chronic or in the absence of more detailed study, a diagnosis of tuberculosis is made, where if such had been done evidence of a different nature would be suggestive of following other lines and a possible cure.

Many such patients having cough, fever, expectoration and loss in weight so closely follow textbook pictures, that even without definite laboratory findings these patients are condemned as infectious or as tubercular and sent away for the finis.

The history and findings of this case are so interesting that I feel that a study of these alone will encourage medical men in all branches to alert themselves.

Case Report: Boy, age 9 years, in good health up to time of operation for removal of tonsils and adenoids. This was performed under ether anesthesia two and a half years ago, the anesthetist using nasal tubes to maintain anesthesia. Following operation patient was taken ill with what was considered pneumonia, but this failed to clear up. After a few weeks of irregular temperature, cough and expectoration, a diagnosis of probable pulmonary tuberculosis was made in spite of the fact that laboratory findings were negative. A place was secured for him at one of the tubercular hospitals, where intensive antitubercular treatment was given, but in place of improvement the reverse took place. A series of X-rays were made but no report other than a clouded left lung was made. Following nearly a year's treatment at the hospital, the usual yearly change in the interne staff took place and the new incoming interne took an interest in the boy and carefully re-examined the X-ray plates and noticed a shadow in the region of the left bronchus suggestive of a foreign body and immediately ordered a new series of plates. The same shadow showed itself in the succeeding plates. The entire left lung was clouded and areas of consolidation were

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found on the right side. The shadow aroused the curiosity of the interne enough to call the writer into consultation and it was considered wise to perform a bronchoscopy.

Operation. Bronchoscopy performed. On entering the left bronchus an obstruction was encountered and with pressure against this there was a sudden rush of very foul smelling pus. As much of this as possible was aspirated from the bronchus and the patient was returned to bed. Following this, he started to cough up large amounts of this foul smelling pus and improved. X-ray the following day showed the same findings as before. A second bronchoscopy was performed and again a large amount of pus was aspirated. After the field was cleared, masses of granulation tissue were seen to fill in the narrowed left bronchus and these were removed with punch forceps. Because of the condition of the patient following these procedures and our satisfaction on opening the path for future operations, the patient was returned to bed.

A week later a third bronchoscopy was performed on a specially made table, designed through the courtesy of Dr. Chester Moses, consisting of a box arrangement over a fluoroscopic table, so made that with a mirror between the shelves, he could see the foreign body in situ, as well as the bronchoscopic instruments and could direct operative procedures. On entering the bronchus this time very little pus obstructed our view. A few more masses of granulation tissue thrown out by nature during these two and a half years were cut away and the foreign body was removed, using a long copper wire, the end of which was shaped like a shoe hook. The foreign body proved to be a piece of hollow rubber tubing, 1½ inches long, corresponding to the end of a catheter. The history easily tells us the story.

Following the removal the patient remarked he felt much relieved and could breathe freely without pain. The cough and expectoration have stopped.

In conclusion, it is clearly seen that if the foregoing were recognized immediately following the operation, or at least if the plates taken during the so-called pneumonia were properly read, the early removal of the foreign body would not have been complicated. If the observation of the recent graduate in medicine had not been made, the boy would have been listed as "another uncured tubercular."

468 Delaware Avenue.

THE NEW YORK ACADEMY OF MEDICINE.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

March 23, 1926.

(Continued from page 620.)

In this general exposition of maxillofacial surgery, I should like to say some words about epithelization by Esser's method, which was started during the war and which revolutionized plastic surgery. It consisted of Thiersch grafting of denuded surfaces by means of stent. The deepening of the labiogingival sulcus, the cure of nasal atresia, ectropion, etc., was thus made possible. This method was ingeniously applied by Gillies, of London, to the correction of a syphilitic nose, in order to provide the missing nasal mucous membrane. When the latter is destroyed, adhesions occur in the region of the pyriform aperture, which give the luetic nose its characteristic appearance. After freeing the nasal skin by excision of the endonasal adhesions, the raw surface thus created is Thiersch grafted on a mold of stent introduced through the mouth. At a later stage, after consolidation of the nasal mucous membrane, a transplant is provided for the nasal dorsum. By this procedure the nose is entirely restored.

Finally, the need of prophylaxis in facial deformities should be emphasized. In this day of preventive medicine, when the efforts of medical science are directed to the art of preventing disease, our attention should be turned toward the same end in rhinoplasty. It is surprising how little can be found on this subject in special literature. Nevertheless, a week rarely passes without our seeing nasal deformities following submucous resections or neglected fractures. These two sorts of nasal deformities, postoperative and traumatic, may, and would be avoided, if precise ideas on this subject were spread among the medical profession at large. An immediate and rational treatment of recent fractures is a thing that has not hitherto been taken sufficiently into account. There should also be an extensive education of public opinion, particularly among women, to prevent criminal acts by "beauty specialists." It is they who provide us with the clientele injected with paraffin with whom we do not always know what to do. These prospective unfortunate victims should receive the prophylactic proctection of the medical profession, rather than that applied later by the courts. A wide propaganda of wholesome ideas on this subject in the medical world as well as with the public is the only remedy.

Dr. Leo Winter, D.D.S. (by invitation), spoke of the wonderful work presented by Dr. Dufourmentel, and then told how he and others had arrived in Europe during the war with a rather crude technique for repairing cases of fractured jaw, but on reaching their destination found that owing to trench warfare there were large numbers of cases with no jaws to take impressions of. Acordingly, they were sent to where they could see some of the work done by Dr. Dufourmentel and learn from him to carry it on. All around were men doing more of this reconstruction work than he had ever seen, for he had done nothing of the type described by Dr. Dufourmentel.

There was one point, however, that he would like to take up. Dr. Dufourmentel had spent several days at the Clinic here and saw several patients complaining of sublexation of the jaw, and had inquired what was being done for them. He was told that they were simply let alone, given physiological rest and their mental condition soothed, etc. He replied that he resorts to the simple procedure of cutting down the joint. While that procedure is apparently a very simple one for him, it would seem that ordinarily the end hardly justifies the means—the cutting down of the joint, with the possibility

of a resulting osteomyelitis—simply in order to remove the annoying sensation of the joint. Of course, with a true ankylosis it would be different.

Another point was that Dr. Dufourmentel uses constantly general anesthsia in correcting ankylosis. Dr. Winter said he would commend the simple technique devised by Dr. Jackson, of Boston, using the sigmoid arch as a guide in passing down the needle and anesthetizing the dental nerve. In that way the operation can easily be done under local anesthesia.

Dr. Herbert L. Wheeler, D. D. S. (by invitation, said that being a dentist, the problem of plastic surgery was something outside of his sphere, but that there were two points in the paper which interested him and which he would like to hear more about.

First, Dr. Dufourmentel showed where on one occasion he cut into the ankylosed joint through the condaloid process to the zygomatic fossa where the ankylosis is supposed to be, and produced a new joint. How about the cartilage in which the joint works, and is it possible to produce satisfactory tissue there that will permit the working of the artificially made joint? Referring to the cases in which the operations were performed by cutting transversely through the ramus, presumably it was done with a burr and engine, rather than with a saw. In the process of setting the mandible back, is one side done at a time, or are both sides reduced at once?

Dr. Wheeler said that he had considerable practice in that sort of work in the eighteen years that he had been at Bellevue, where he had seen over a thousand cases of fractured jaws, 126 cases during the past year, and one of the most difficult things is to obtain immobility where the mandible is concerned. He has been in the habit of resorting to any kind of splint that would accomplish the desired result. At Bellevue they are opposed to wiring, but there are cases where nothing else will take its place. There is less liability of ankylosis of the joint and more certainty of a quick and firm union by utilizing properly made splints, particularly where the fractures are in such position that sound teeth are posterior to the fractures. In such cases the jaw can be made to move normally and the probability of ankylosis is done away with.

Dr. Wheeler also said that he would like to see some of the appliances in which the mandible was held immobile during the process of uniting after the ramus had been cut and the mandible forced backward. He had never seen that. He had been in France during the war and had access to various hospitals, and saw wonderful work there. In our hospitals here the type varies in this way; in France, the men were all in fairly good physical condition. They had been trained as fighting men, whereas here, most of the patients who are brought in with fractures due to accidents, such as automobiles, thugs, police arrests, industrial injuries, etc., many of the men are in poor condition and the jaws do not heal as rapidly as did the cases seen in France during the war. That is undoubtedly due to the physical condition of the patients who are not under training and restraint as were the soldiers in France during the war.

Dr. Gustave Aufricht (by invitation) expressed his appreciation of the opportunity offered him to discuss Dr. Dufourmentel's illuminating and comprehensive paper before this audience. He had condensed the great and fascinating material of plastic surgery into a complete presentation in a comparatively short time, and had illustrated these by a large collection of very successful cases. Considering the short time available for discussion only a few points could be emphasized: "After a personal conversation with Dr. Dufourmentel, I have learned that he is a sculptor, and that is doubtless one of the most important factors wherein the secret of his success lies. Plastic surgery is sculpturing with surgical technique on human tissue. The sculptor works on his lifeless clay with his relatively simple instruments; while the surgeon-sculptor uses the complicated armamentarium of the surgery and his material is living, sensitive, human tissue. Instead of lifeless clay, he is modeling vital skin, bone, cartilage and fat, with all their limitations. Aside from his aim in producing an artistic form, he must consider a large number of factors, such as biology, anatomy, asepsis, healing, blood and nerve supply,

shrinking, resorbtion, scar formation, color, consistence and function. The plastic surgeon has to be an artist with the ability not only of a critic, to see the deformities, but also of a productive sculptor to visualize stereoscopically and to carry over his vision into the realm of reality. The plastic surgeon should be primarily a sculptor and only secondarily a surgeon. The finest surgical technique, *conditio sine qua non* for him, should be only the means to the end. It is not enough merely to change the deformity; the change must be an improvement, and the greatest possible improvement. In the case of the correction of the nasal deformity, the nose must be considered not as a unit in itself but as a part of the whole face, and has to harmonize with same.

Just a few words more about methods: It does not make much difference which methods we use; the main thing is the result. Professor Joseph, my teacher in Berlin, created the most scholarly methods, particularly in rhinoplasty. They are classical today, and in my opinion they will be classical forever; yet I have the greatest respect for any other methods if the surgeon shows results with them. The success in plastic surgery depends not upon the methods of the surgeon but upon the vision of the artist."

DR. J. E. SHEEHAN said that it had been a pleasure to listen to Dr. Dufourmentel's paper, which he had been kindly allowed to see in advance. What specially appealed to him, and probably would to all, was the consistent adherence to sound surgical principles evidenced in this, as in all the recorded examples of Dr. Dufourmentel's work. But it could not well be otherwise, when one considers by what methods young surgeons in France are fitted for the work in which they are expected to engage. If one turns to the thesis offered by Dr. Dufourmentel himself for his doctorate degree, plentiful evidences appear as to what these methods are. The candidate, age 30 years in that fateful year, 1914, is described as sub-chief of the laboratory of the amphitheater of anatomy of the Paris hospitals, a title which suggests both opportunity for study and the energy to avail himself of that opportunity. He explains that his thesis was worked out in the service and the laboratory of Professor Sebileau, and his address of tonight suggests that Sebileau had been influenced in former years by Nelaton and Ombredanne, two great names in facial surgery. On that occasion, however, he dealt with recurrent paralysis, and the thoroughness of study demanded is shown by the fact that fifty cases of his own observation formed the groundwork of his paper, while the bibliography indicating the special reading included 264 titles.

The war broke out immediately afterwards, and Dr. Dufourmentel accompanied his chief, Professor Sebileau, to the war hospitals. Very soon he was placed in command of the surgical center for facial disfigurements at Chalons-sur-Marne. After four years of concentrated experience, he published, in 1918, a brochure on emergency surgery of the face and neck. Even a war could not break a French surgeon of the admirable habit, which all of us envy, but very few of us adopt, of taking time to think over the day's work and *write down* what it has revealed that is new and good. Four years later, in 1922, when he was Chief of the Clinic of the Faculté de Médecin, he found time to issue another book, this time on the sequelae of wounds and injuries in the faciomaxillary area. It can be seen, therefore, that tonight's paper is not the product of any sudden inspiration. Part of his subject is covered in those two books—one four, the other eight years old, an age in the history of facial surgery as we now understand the term. In that year also, another candidate for the doctorate expressed to Dr. Dufourmentel his gratitude for encouragement and assistance—a passing detail of his work at the Lariboisiere. In France, it would seem, one discharges a debt to his seniors by services rendered to his juniors.

Taking the record as thus briefly stated, we have before us a model and an example of how a young surgeon should fit himself for a surgical career, whatever be the specialty he may choose.

In the subject discussed this evening, ten years have made a very great difference. Before that there were a few, a very few, great but greatly neglected names and the written records of their work, and that was all. Now,

thanks to the intensive development that has been guided by the lecturer himself and by others, some of whom he has named, there is a whole code of standardized procedures which are in common and daily use. There is no excuse, therefore, to be offered for incompetence or for rushing unprepared into a field where only real ability, backed by study and based on the principles of sound surgery, has any rightful place. In providing us with a wholesome reminder of all this, our distinguished visitor has done us a real service.

DR. CARTER congratulated Dr. Dufourmentel upon the excellent manner in which he had handled these terribly mutilated cases, and asked for a little enlightenment in a purely practical way: First, is there any special advantage in the tubular flap? It would seem to more or less constrict the blood vessels. In his own practice he has been accustomed to cover the raw side of the flap with a thick coating of vaseline, which protects the blood vessels and assures the circulation in the flap.

Second, has a cartilage transplant any preference over bone in his opinion, or does he use cartilage in one place and bone in another? Dr. Carter said that he himself uses both cartilage and bone and finds that each has its distinctive use. A number of years ago he had devised the use of conjoined bone and cartilage from the rib in nasal surgery and had secured excellent results. In his opinion, bone should always be mortised into skeletal bone. There does not seem to be any place in plastic surgery for foreign bodies being introduced into living tissue. This matter was settled a number of years ago by such men as Weir, W. T. Bull, Charles H. Knight, etc. Ivory is a foreign body; even though its composition may be the same as bone, its constitution is not; that is, the arrangement of the atoms in the molecule of ivory is not the same as in bone. If a thing is not part of the body, it is a foreign body, and nature abhors the presence of a foreign body in the living tissues.

In one of the cases where the nose was destroyed, Dr. Dufourmentel had used a flap from the arm. Dr. Carter said he had had several such cases, and in most of them the patients were Italians, who in domestic difficulties have a habit of biting off each other's nose. He prefers to correct such cases by using a flap from the forehead; it has a better color and does not cause the patient so much inconvenience during treatment.

It would be interesting to know what kind of anesthesia Dr. Dufourmentel prefers in his work, and also whether he has ever used Dr. Carter's bridge splint in fresh fractures of the nose. Dr. Carter said that he himself has found this instrument very useful and considers it the best method for placing the tissue in proper position and holding it there until union occurs.

DR. SEYMOUR OPPENHEIMER: It is a source of keen satisfaction for me to see this fine demonstration given by my friend, Dr. Leon Dufourmentel. I know much of his work and ideas from personal contact, and I feel like many others who are engaged in this fascinating field of work, that I stand ready to worship at the shrine of a great master. It is men of his type who, beginning largely with the surgery of war, are now giving corrective and cosmetic facial surgery the legitimate status in the profession. Dr. Dufourmentel has dealt particularly with the status of this work in France, and I should like to say just a word as to its development and status in America.

Prior to the war, all of this work seems to have been shrouded in mystery and unsurmountable difficulties were supposedly present, and a few legitimate workers in the field, such as Roe, of Rochester, did naught to enlighten us. Their writings were of the vaguest type, and their discussion so difficult to follow that we gave up in despair, but with the advent of the great World War, and its pressing demands for the practice of reconstruction of the maimed and disfigured, cosmetic facial surgery immediately came to the front and a great demand arose for trained surgical workers to take care of the head and face injuries incident to trench warfare, where surgical work of a cosmetic or restorative nature was particularly indicated, which is peculiarly within the province of the rhinological surgeon.

Prior to the war as well, men who worked in this field were looked upon with askance by their professional brethren. Possibly it was, quoting a French author, that "ordinary men commonly condemn what is beyond them." My

thought on the subject is that if there is a justification for the purely cosmetic part of this work, and I believe there is, having ofttimes a bearing upon the economic, physical and mental state of the individual, it should not be regarded with indifference by the trained rhinological surgeon, for by his very indifference patients are driven into the hands of the advertising quack, charlatan and beauty parlor surgeon.

I do not want to go into the academic discussion as to the relative value of different materials used for implantation, for correcting nasal difficulties, such as ivory, rib cartilage or other materials. I have used all of them. It might be interesting to mention, in passing, a case where I implanted a strip of celluloid nine years ago and which has remained in situ.

In conclusion, I might say that we rhinologists should exercise more care in our operations for resection of the nasal septum, for in the past five years I have surely seen at least two dozen cases which required corrective measures to overcome a depression resulting from the operation.

Before I take my seat, may I simply again emphasize the point, that the men to do this work successfully are men such as you are, members of this Section, trained and skilled head surgeons, and only then, and not until then, will these cosmetic procedures, ethically speaking at least, come into their own.

DR. DUFOURMENTEL, in closing, said it was impossible to answer all the questions that had been asked, but that he would try to give four or five explanations. Dr. Winter had asked whether the operation for creaking jaws was not a very serious one for so simple an affliction. If the operation is properly performed and the patient kept perfectly quiet there is no danger of ankylosis, no danger of any trouble; because if you take out the meniscus, you have after the operation two pieces of cartilage to anchor. (Demonstration on blackboard.)

In case you must take out the condyle, you may be so quiet indeed, you have bone surface downward (and cartilage up above) and ankylosis is impossible between bone and cartilage. It is only possible where the two surfaces are bone.

As for the question of Dr. Wheeler: Is it necessary to put out the two condyles, left and right? Yes, it is necessary to put back both, and the better way is to do that in the same time.

To the question of Dr. Carter, I answer: The tubular flap is never necessary. Many surgeons think that it is better if the flap is free during a few days or weeks; but it is not absolutely necessary.

To the question of comparison between cartilage and bone: In my opinion cartilage is sufficient if it is transplanted in a motionless region, and that bone is better where it is inserted between two active parts of bone. For example, if you have a fracture and loss of substance of the lower jaw, it is necessary to use bone; and if you have to replace only a part of skeleton without moving, like the edge of the nose, bone is not necessary. You have a slight moving, but it is not important. The cartilage is easier to take and the transplant easier to graft.

The question of anesthesia: In nearly every case I prefer local anesthesia. I employ general anesthesia when the patient wishes it, or with a child or young person; but usually the local anesthesia is better.

I will thank Dr. Maliniak, Dr. Eastman Sheehan, Dr. Aufricht and Dr. Oppenheimer for their indulgent appreciation.

SECTION ON OTOLOGY.

Regular Meeting, April 9, 1926.

Fulminating Mastoiditis. Dr. Harold Hays.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. HELLER told of a case he had reported a year previously which very much resembled those cited by Dr. Hays. The patient, a child, was first seen on a Friday afternoon at about 2 o'clock. There was no history of any grippe or measles, etc., but the child had had a bad night and a temperature of 102-103.° Just before he arrived, the left ear perforated spontaneously and when he saw the child it was feeling very much better. In the right ear, however, the drum was bulging and red, and he incised both. Late on Saturday, the mother noticed that the child's face was crooked, and he was again called in, just forty-eight hours after first seeing the case. The boy had a complete right-sided facial paralysis with mastoid tenderness and swelling. The first ear which had perforated spontaneously gave no trouble. The child was immediately sent to the hospital, and at operation just such a condition as Dr. Hays had described was found—everything was broken down and mushy. The child made a good recovery and the facial paralysis cleared up except a slight drooping of the right upper lid. He was very glad to report the case again, for at the time he had first spoken of it the facial paralysis had not disappeared.

Physiological Factors in the Control of Otitic Meningitis. Dr. Wells P. Eagleton.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. GUTTMAN had been impressed with the excellent presentation of the subject but said that a few of the points made were quite new and radical and that he hoped Dr. Eagleton would explain them a little further. What does he mean by saying that he could diagnose localized meningitis by the absence of the response of the vertical canal on the opposite side and the presence of the response of the horizontal canal on the same side? Dr. Guttman said he thought that statement had been made by Fisher, who tried to diagnose cerebellopontine angle tumors by this sign. He stated that in those cases the symptoms were due to intracranial pressure, but he did not think it would be pathognomonic of localized meningitis.

Dr. Eagleton had mentioned the case of a boy with a perforation of the tegmen causing a localized meningitis, in which he removed the bone, cut into the dura, and saved the patient's life. Could Dr. Eagleton determine beforehand whether or not a meningitis was going to be localized or generalized? We do not realize how many cases of localized meningitis do get well. Is he ready to advise that in every case where he suspects localized meningitis, after removal of the necrosed bone, that the dura should be incised?

DR. MAYBAUM said that Dr. Eagleton's discourse had thrown light upon certain phases of meningitis to which thought was seldom given. The caloric findings in so-called cases of protective meningitis were entirely new to him. Were these findings present only in protective meningitis confined to the posterior fossa or in other localities as well?

Dr. Maybaum said that he was interested in the statement made regarding the course to be followed in cases of Gradenigo syndrome which showed evidence of progress. It is well known that many of these cases recover with or without mastoid operation. He had thought that the mortality was higher than 15 per cent. It seems to him that the procedure suggested by Dr. Eagleton's of opening the dura in those cases of Gradenigo syndrome of a progressive and severe type a rather startling one, to say the least.

It would be interesting to know the spinal fluid findings in many of the meningitis cases referred to by Dr. Eagleton. In his own experience a very

high cell count did not necessarily mean a fatal termination. He recalled an instance of labyrinthine suppuration with meningitic symptoms where the cell count was 8000 polys; after a labyrinthectomy the patient made a complete recovery. This patient was presented before the Section some time later. He cannot recall a recovery in cases of otitic meningitis in which bacteria were found in the spinal fluid.

The Section is to be congratulated upon having had an opportunity of listening to Dr. Eagleton's paper; the reading of it will undoubtedly prove interesting and instructive.

DR. GUTTMAN had been impressed with the excellent presentation of the subject, but a few of the points presented were quite new and radical, and he hoped Dr. Eagleton would explain these a little further. What did he mean by saying that he could diagnose localized meningitis by the absence of the response of the vertical canal on the opposite side, and the presence of response of the horizontal canal on the same side? Dr. Guttman said he thought that statement had been made by Fisher, who tried to diagnose cerebellopontine angle tumors by this sign. He stated that in those cases the symptoms were due to intracranial pressure, but he did not think it would be pathognomonic of localized meningitis.

Dr. Eagleton mentioned the case of a boy in which there was a perforation of the tegmen, causing a localized meningitis. in which he removed the bone, cut into the dura and saved the patient. Could Dr. Eagleton determine beforehand whether or not a meningitis was going to be localized or generalized? We do not realize how many cases of localized meningitis do get well. If he is willing in a case of localized meningitis, to have the bone removed, and the dura cut, etc., it is very important that his advice be followed.

Is he ready to advise that in every case where he suspects localized meningitis, after removal of the necrosed bone, to have the dura incised?

DR. EAGLETON: The last question can be very easily answered. If there are meningeal symptoms in a mastoid condition and the symptoms are not relieved after the mastoid has been opened, then the dura should be opened—and don't be afraid of it. But if you have a case with meningeal symptoms and have not opened the mastoid it will be right to clean out the mastoid and then stop; that is a definite policy with me. If I see a case that has been opened and the meningeal symptoms have continued, I then open the dura, and if it can be done safely—simply make a little cut in several places; if we get a lot of fluid, we know that the case will get well, but if we don't get fluid we are not delighted, for we are not sure of it. Put a small piece of cotton and vaseline over it, and put a tail on it, and it will drop off in a few days and the arachnoid space will be obliterated. That is a definite policy with me today.

As to the cerebrospinal fluid and the cell count: Examination of my records shows that in a localized meningitis, say from the labyrinth, this is what will happen. There will be an invasion of the subarachnoid space and a very high cell count in the lumbar region, etc. Any case of labyrinthitis that develops a headache has had a meningitis; it may not have been a septic meningitis, but there has been a meningitis at the beginning of the labyrinthine disease. When they have the headache it lasts for several days. If you do a lumbar puncture, you get a high blood count. That is the time when the process is rapidly extending into the cisterna, and if you do a cell count it is low and stays low as long as the process is limited; but the moment it breaks through and becomes a general septic meningitis it goes up again.

The Chairman said that whenever they have micro-organisms they die, no matter what the cell count. That is true; but put it in that philosophy and see how it fits. I know it fits. I am sure that is what happens—that we have a period of invasion from the meninges, whether in the labyrinth or elsewhere, a high cell count in the cerebrospinal fluid. On becoming localized, the cell count falls, and as long as it is localized a lower cell count; but the moment the adhesions are broken through the process becomes generalized and the cell count is very high.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

Regular Meeting, April 28, 1926.

Patient Who Can Speak, Sing and Hum Without the Use of the Vocal Cords. Dr. P. Mario Marafioti.

(Published in full in this issue.)

DISCUSSION.

DR. GUTTMAN: Does Dr. Douglass claim that the vocal cords are immovable, then how does he do it?

DR. DOUGLASS: I don't know how he does it, and no one knows yet, because it has just been found out. If you will examine his tube you will see that he cannot use his vocal cords.

DR. GUTTMAN: Of course sound must be produced by vibration somewhere. The air of the lungs produces the force. Now I understand the vocal cords are immovable. What vibrates? If there is no vibration no sound can be produced. This sound is not a pure musical sound.

DR. MARAFIOTI: I would say pure sound but not a musical voice. The timbre of the voice is not so strong, but the number of vibrations corresponds to the one required by the note.

DR. GUTTMAN: Now this compound musical sound must have some source.

DR. MARAFIOTI: My idea is that the air vibrating in the space above the larynx produces voice. As a matter of fact, you can make sounds with air vibrating through the lips, as in whistling, and if you put your fingers on your lips you can feel the vibrations. Similarly, you can hum with the air vibrating in the nasal cavities and the minute you stop the vibrations by pressing the nostrils, the humming ceases. This subject does not yet know how to do that well enough, but I can show you on myself. The air can be directed into the nasal passages, etc.

DR. DOUGLASS replied that he did not know how it was done, nor does anyone yet, for it has not been worked out; but that if anyone would examine the man's tube it could be seen that he could not use his vocal cords at all. Of course, the sound must be produced by vibration somewhere, but since the vocal cords are immovable, the reason why the man can change the pitch of his voice is not clear except that the change in pitch cannot come from any part of the larynx. One may conjecture as to what produces the change of pitch, but the fact or reason has not yet been worked out. The case will need further investigation in order to explain the changes in pitch.

Primary Epithelioid Cancer of the Uvula. Presentation of Patient. No Recurrence Eight Months After Operation. Dr. Wm. W. Carter.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

Injection of the Recurrent Laryngeal Nerve in Tuberculosis of the Larynx. Dr. Henry P. Schugt.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. DOUGLASS asked if paralysis was secured in each case or was it a haphazard method.

DR. SCHUGT replied that about eighteen cases were injected and secured paralysis in fifteen; but naturally one could repeat the injection.

DR. WHITE inquired in regard to the concentration of the alcohol injection.

DR. SCHUGT replied that he used 80 per cent alcohol, and always combined it with novocain. In a few instances he used 50 per cent.

DR. ARTHUR PALMER asked whether this method had any effect on the pain on swallowing.

DR. SCHUGT replied that he had not injected any cases that had pain on swallowing.

DR. ARTHUR PALMER asked whether tonsillectomy was performed under general or local anesthesia.

DR. OBERRENDER replied that general anesthesia was used.

DR. JONES asked whether lipidiol was tried on only one case or on others. In the second case, were any physical examinations made? How do you account for increase in expectoration from 75 c.c. to 200 c.c. after treatment?

DR. OBERRENDER replied that it was tried on a series of cases. Regarding the expectoration of 75 c.c. when he first came in, there *was* an increase in expectoration. That could be explained; for in a lung abscess one occasionally opens up a bronchus which has not been draining well and following this opening up, discharge naturally increases. Physical examinations were made, and quite carefully, but nothing could be said definitely as to whether we were dealing with an abscess or a case of tuberculosis. As a matter of fact, the woman had positive signs, microscopically, of tuberculosis around the cavities, although two series of ten sputum tests had failed to show the bacillus.

DR. FORBES said that Dr. Oberrender should not be discouraged in the treatment of his lung abscesses when resection of the lung had a mortality of 40 per cent—one out of every three. There is still much work to be done along these lines and none of the men are going to progress until there is a hearty co-operation of the bronchoscopists, the radiologists, and the general practitioners. That is the strongest plea for bronchoscopy.

Dr. Forbes said he had never himself had the misfortune to have any fatalities of this type; these cases of Dr. Oberrender's were probably atypical cases. The specialist cannot possibly blame himself for a cerebral hemorrhage. The more we do, the more we will learn; and the more rare cases we will see; the bronchoscopist and the medical man will both learn something in these irregular cases, and Dr. Oberrender was to be congratulated on his courage in reporting these failures. More of these should be reported if they occur, as well as our successes.

The Use of Opaque Substances to Localize a Lung Abscess. Dr. E. J. Ryan.

(Published in full in this issue.)

The Reaction of the Lung to the Aspirated Peanut. Dr. J. D. Kernan.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. FORBES said that he did not know Dr. Kernan personally; he would think he had selected his successful cases, but that, of course, was not so. Sometimes we are misled by the facts and figures that come to us, and oftentimes the more prominent the bronchoscopist, the more nervous we have been made by the telling of certain foreign bodies that would certainly be fatal within a definite period. Dr. Forbes agreed with Dr. Kernan, and added that he could not recall a case in the babies' ward at the hospital which had been followed by death. His own results have been very satisfactory, but he could not present such a remarkable series as Dr. Kernan had reported. An interesting point in one of the cases was that the child had coughed out a piece of the peanut, which struck Dr. Kernan's eye. The same accident had happened in his own experience—in this instance a sharp pin—but fortunately he was protected by his glasses and the pin fell to the floor. Since then, he has told his staff and students that if they did not ordinarily wear glasses, they should in such operations wear glasses with plain lenses in order to protect the eyes.

The flattening of the diaphragm in the case spoken of was due to the emphysema, which occurs in cases of foreign bodies blocking the bronchi. It was discouraging that better lantern slides could not be made from X-ray plates. Perhaps Dr. Law could explain why.

DR. LAW said that his acquaintance with slide-making was a purely technical affair, but that this work should be in the hands of one who was thoroughly familiar with the correcting of an illuminated field, and the one who made the slide should know what was the point to be brought out. The negative as you see it has many dense areas and these may be the part you want to study; whereas the slide-maker may simply produce a very pretty picture instead of bringing out the point desired. If you want a stisfactory slide you should have the man who is going to make it come to the laboratory and explain to him what you want, and if it does not meet the requirements, have it done over again. He had himself spent as much as three entire evenings in getting a single satisfactory slide. If the photographer were to do that you would

have to pay $5.00 a slide, making the expense too great. That is why you cannot always show on the slides what you see in the plate.

As for the detection of nonopaque foreign bodies in the lung, the location is made not on the infiltration or thickening, but on the obstructive emphysema which shows. The foreign body acts as a ball valve, the air gets in, and cannot get out, producing an obstructive emphysema. One of the slides showed very plainly this obstructive emphysema on one side.

DR. G. D. WOLF said one point in regard to X-ray diagnosis of nonopaque bodies in the bronchi was not brought out and should be emphasized. Dr. Menges, of Dr. Jackson's Clinic, has brought this out, and with correct technique the location and shape of these bodies could be diagnosed with the aid of the X-ray. In a round, nonopaque foreign body, a complete occlusion of the bronchus involved takes place, thus not permitting any air to come in during inspiration or any to be expelled during expiration, with the result that whatever air is in that lung is gradually absorbed and atelectasis of that lobe with a compensatory hyperemphysema of the other side of the lung ensues. In oval foreign bodies, some air goes into the lung during inspiration, but none comes out during expiration, as the bronchi are narrowed during this act. This results in emphysema in the involved side with few, if any, changes in the healthy side. It is therefore exceedingly important that when a nonopaque foreign body is suspected that the Roentgenologist be instructed to take two exposures of the chest, one at the end of extreme inspiration and the other one at the end of extreme expiration.

DR. A. PALMER said that one of the most interesting points made was the marked improvement obtained by the removal of the foreign body in even a short space of time. Many of these cases of foreign body in the lung are being missed; many of them do not come to the bronchoscopist. This matter should be brought to the attention of the internist. Many of these cases are diagnosed as rapid pneumonia or something of that sort, whereas they are foreign body cases. The symptoms of coughing and choking and gagging when a child has had something in its mouth are often overlooked, and many children could be saved, instead of being lost because the foreign body was not sought and found.

DR. FORBES said that in one of his cases he had used Fowler's solution after cleansing the lung abscess. For a time the effect seemed good, but later no progress being made, the patient was operated upon by a surgeon. That was the only case where it had been tried. There may be some value in using arsenic in the form of Fowler's solution or in the intravenous use of salvarsan.

DR. KERNAN, closing the discussion, said he merely wanted to mention that in the last case, in abolishing the smell of the sputum, the man had been given several small doses of salvarsan—although he was not syphilitic—thinking that it might be due to the same form of spirillum. Whether the improvement in the odor was due to the salvarsan or the bronchoscopy, or to both, he could not say.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

Regular Meeting, May 26, 1926.

Presentation of Cases: Sinusitis. Dr. Julius I. Klepper.

(To appear in a subsequent issue of THE LARYNGOSCOPE.*)*

DISCUSSION.

DR. FORBES said that Dr. Klepper was to be congratulated for presenting three such interesting cases. The rest of the evening might very well be spent in discussing them. An especially interesting point was that with a continuing tendency to retinitis, even with doubtful X-ray findings, the patient should be given the benefit of the doubt and the sinuses should be opened and drained. Dr. Klepper was also to be congratulated on his results. He said that the man had 10/200 and then went down to fingers at only 2 feet, and then improved to 20/200; the vision will probably improve even more. Dr. Forbes said that he had seen some of these cases go along for a year and still show improvement.

DR. HERRIMAN said that he was especially interested in the cases of sinusitis, for it would help him greatly in a dilemma upon which he was working where the patient required a great deal of help—a man, age 60 years, with a pansinusitis. An extensive double frontal sinusitis operation had been done, taking out a large portion of the superior maxilla, etc.

The temperature had dropped to 98.3° and they were hoping for a favorable result.

Hemophilia Against the Rule. Dr. Robert H. Fowler.

Dr. Fowler said the aim in reading this paper on hemophilia and its relations to the tonsil operation had been to evoke just the type of discussion that had taken place at the meeting; that he thought the suggestion of the hemophilia being related to the streptococcus infection of the gums was a particularly good one.

With regard to postoperative hemorrhage in general, after the tonsils have been removed, in his opinion, a careful study will show that all the conditions that lead to hemorrhage give an opening for prevention; that as we get further information we draw away from the idea that hemorrhage after tonsil operation cannot be prevented. It is irritating to hear a surgeon say that "It is all a matter of luck." That is not so. It is not luck. We find three causes.

The hemophiliac type is one (very rare). We can eliminate this type by taking careful *family* history.

The second type is the non-hemophiliac bleeder; and that type can be spotted on careful *personal* history—the patient has a nosebleed that lasts half an hour, or has had hemorrhage after previous operation.

The third type is much the most common, namely, an error in technique at the time of operation: First, leaving a piece of tonsil at the base. Second, removal of muscle with the tonsil. Third, failure to tie a large vessel that is bleeding when the operation is finished.

Ninety-six per cent of all cases fall into the third type, 90 per cent under the single head of failure to tie off bleeding vessels.

Here, then, is the opportunity for improvement. If we study these causes of postoperative hemorrhages and combat them with the proper preventive measures, hemorrhage after tonsil operation may be almost excluded.

DR. HENRY KOPLIK said that this was a very important paper, especially in that it gives warning that tonsil operations occasionally result very seriously. In the second case, the particular cases reported have been traced better than any other published cases he had seen, because it showed why, and as a matter of fact those cases which are doubted in the literature do occur, and occur as exceptions. When Bulloch and Fildes published their great monograph on hemophilia they did and did not doubt the possibility of transmissibility to female children from the females; but it has been shown since, and especially in this paper, that that is possible.

Dr. Koplik said he had seen the patient when ill. She was absolutely exsanguinated. He had not thought she would recover. In the case of the little boy, the mother had a distinct history of hemophilia and he had advised against the removal of the tonsils; first, because of the mental strain on the operator, and, secondly, because of the possibility that there might be a hemorrhage, even if the brother had had no hemorrhage after operation.

There is about 2 per cent of exceptions to the rule—that is, that hemophilia does occur in about 2 per cent of the cases of female children. The textbooks admit that, though the rule is that hemophilia occurs only in the male line. In reading Bulloch and Fildes very carefully we find that they rather hesitate to put down absolutely that only the male children in the female line are affected.

The question has arisen why hemophilia occurs in the children, male or female, and why not in the women as much as uncongenital traumatic hemorrhages. Hemophilia has been known since the time of Talmud. In circumcision the Jews found that some children died of hemorrhage and made a rule that if two children died successively in a family, circumcision could be abrogated in that family; so the knowledge of the occurrence of hemophilia is very old, but American literature has the credit of establishing hemophilia as a distinct entity, through the paper of Dr. Otto, and to Dr. Benjamin Rush. The latter established the fact and told Otto (of) some children that had had hemorrhages.

What causes the hemorrhage? We don't know. Why should a hemophiliac bleed and then stop bleeding after treatment? That is probably because he gets something in the strange blood which helps to stop the hemorrhage spontaneously. About 2 per cent of all the cases of children transmitted through the female line occur in female children instead of in the male. There is a certain percentage among the male children that bleed, whereas in the same family another member does not bleed. Therefore, for our own sakes, we should not operate in any family where there is a history of hemophilia without letting the patient take some share of the responsibility. That was proposed to the mother of this boy, and she refused, hence the advice that he should not be operated upon.

What is the hemorrhage due to? We don't know. What means can we take (outside of hemophilia) to avoid the hemorrhage? The coagulation point of the blood? It does not tell much; not only that, but the best men, like Wright, of England, differ as to the reliability of the present tests of the coagulability of the blood—as you find much diversity in the time of coagulation; say two people make the test at different times, there is a difference. In one case, there was a difference of four minutes. Many men will not operate on any case where there is a suspicion of hemophilia. We must exclude from hemophilia all those cases of hemorrhage of indistinct origin, hemorrhage in the newborn, etc., which have no relation to hemophilia.

DR. FORBES said he would like to add two cases to those reported by Dr. Fowler, which were evidently the starting of a series, etc.

In this instance, they had been unable to trace back further than the father and mother. The father of these two children was himself a bleeder: he had had three teeth extracted, and bled for twenty-four hours; and then one tooth was extracted and he bled for thirty-six hours. The mother's history was negative. There were no boys in the family, but one of the girls, age 10 years, had bleeding after a tonsillectomy, lasting three days, and another after a molar was removed, lasting for twenty-four hours. The other little girl upon whom he had operated gave no history of bleeding, but when the history was taken the bleeding time, tested by a rather elaborate method, Biffie Brook's, was 14, 12 and 6 minutes, calcium lactate was given. The facts were stated to the mother, and she was quite willing for the operation, under the conditions. The operation was performed in a sanitarium at 3 o'clock in the afternoon, and it was 10 o'clock before the bleeding was controlled, etc.; it was finally checked by packing. The child was in the hospital for ten days instead of twenty-four hours. The next generation will show what will happen to these two girls. It was a matter for study, and the younger men will have an opportunity of watching the two children.

DR. BRAUN emphasized the little reliance that can be placed on the present methods of testing the coagulation time of the blood. In a large number of cases, depending upon the testing, he disregards the coagulation time entirely; but in cases where it was as much as fifteen minutes he has operated without any untoward results. In other instances, where the coagulation time was as short as four minutes, there was considerable hemorrhage, showing the absolute unreliability of the tests. Furthermore, the personal factor of those making the test is important, also the place from whence the blood is tested. If taken from the skin of the ear or finger, the chances are that the coagulation time will be decreased; if taken directly from the vein, one is more likely to get an accurate clotting, but even that does not give an absolutely reliable index. The most important single factor is the previous history of the patient. Any patient to be operated upon is likely to have some history of a scratch or slight cut, and the question of how quickly it heals or the bleeding stops is important; also of the question of whether they get ecchymosis easily. Such persons are more likely to bleed than others. The history of the case is most important, and also the family history.

DR. KOPLIK: It has been said that the bleeding time differs according to the worker who makes the test and the place from which it is made—the ear, the finger, etc., or the veins. It is supposed that the tests furnish a certain amount of secretion which helps or retards the bleeding time in these individuals, and it varied very widely. We cannot depend upon these tests at all. As has been intimated this evening . . . had children operated on with prolonged bleeding time and coagulation time, and no bleeding. The history is the principal thing.

BOOK REVIEWS.

Otologic Surgery by Samuel J. Kopetzky, M. D., F. A. C. S., Professor of Otology, Polyclinic Medical School and Hospital, New York; Director, Department of Otolaryngology, Beth Israel Hospital, New York, etc. 102 illustrations, including 4 color plates and 21 charts. New York: Paul B. Hoeber, Inc. 1925. Price $8.00.

There is an element of individuality and originality that the thoughtful and critical reader gets who studies this book. It emphasizes the most salient and justifiable features in the production of scientific literature—personal experience, independent observation and fearlessness in conviction and expression. The author departs from the regulation plan of classification in textbooks on Otology and confines himself strictly to his subject—Otologic Surgery. He divides his subject-matter into twelve chapters. His classification of Diseases of the Middle Ear on the basis of Pathogenesis is attempted in an even more elaborate form than ever presented before. The chapter on Incision of the Membrana Tympani is comprehensive and delightfully logical.

Both the Simple Mastoid and Radical Mastoid Operations and the Operation on the Labyrinth are given due consideration from every angle and he presents all data tersely and seems to omit no phase of the subject.

Perhaps the outstanding chapters in this book are those on Otogenous Systemic Infections, Surgery of the Meninges and Otitic Brain Abscess. In these chapters are displayed the best talents of expression, items of practical experience and evidence of logical conclusion. These chapters are exceptional monographs and impress the reviewer with their clarity, common-sense and finesse.

Another individual feature of the book is the concluding chapter on Cases illustrating points in the text. Here the author has drawn on his wide experience in selecting characteristic cases to emphasize his conclusions and deductions.

There is no handbook on Otologic Surgery, in English that offers more features for commendation than this volume, and we frankly rank it as one of the best literary products of modern American Otologic Surgery.

M. A. G.

Studies in the Anatomy and Surgery of the Nose and Ear. By Adam E. Smith, M. D., Past Chief Medical and Sanitary Office, Nile Reservoir Works, Assuan, Egypt; Past Instructor in Operative Surgery, Columbia University Medical College; Past Attending Surgeon, German Hospital, O. P. D., New York City. New York: Paul B. Hoeber, 1918.

This monograph has as its outstanding features the contributions to a special field in which the author has devoted much time both in research, in the laboratory and at the operating table; the series of 45 plates are drawn with great accuracy from actual anatomical preparations and are not schematic in character; the text is crisp and clear in its presentation and the typographical character of the publication is faultless.

A brief resume of the contents is offered here to indicate the subject-matter discussed.

I. The Importance of Nasal Breathing.
II. Some Suggestions on the Treatment of Intranasal Conditions.
III. A Contribution to the Anatomy and Surgery of the Nose and Its Sinuses.
IV. Anatomical and Surgical Desiderata in the Exposure and Removal of the Pituitary Gland.
V. Postural Treatment of Otitis Media and Mastoiditis.
VI. A Contribution to the Anatomy and Surgery of the Temporal Bone.

Some of this subject-matter has already passed into the history of literature as substantial contributions and we compliment both author and publisher on its present form, quality and accessibility. M. A. G.

The Thyroid Gland. By Charles H. Mayo, M. D., Professor of Surgery, University of Minnesota, Mayo Foundation, Rochester, Minn., and Henry W. Plummer, M. D., Professor of Medicine, University of Minnesota, Mayo Foundation, Rochester, Minn. Series Number Four. St. Louis: C. V. Mosby Company, 1925. Price, $1.75.

The preface of this monograph contains the following paragraph:

"The extent of work done upon thyroid disease can scarcely be comprehended, for internists, surgeons and laboratorians have been equally active in efforts to solve its riddles. The interpretation of results thus far attained is not easily made. It is most gratifying to the Beaumont Foundation Committee of the Wayne County Medical Society to present this opportunity to the readers of the Fourth Lecture Series of an authoritative resumé of thyroid disease from one of the greatest American medical centers and contributed by master students of the subject who have had unexcelled opportunities for investigation in all of its interesting phases."

In the hands of Dr. Charles Mayo and Dr. Henry S. Plummer, the question of the thyroid gland is succinctly analyzed and crystallized. The entire problem of the ductless gland is so imminently before the medical profession today that every complete thought must help in its final solution. M. A. G.

Lehrbuch der Sprachheilkunde (Logopadie). A textbook of Speech Correction fur Arzte, Padagogen und Studierende von Privatdozent Dr. Emil Fröschels, Leipzig and Vienna: Frnz Deuticke, 1925.

This is the second edition of Fröschels' book and is entitled to careful perusal by all who are interested in defects in speech and their correction. It is a dignified volume and presented in the form of a series of lectures.

This volume includes chapters on the Anatomy and Physiology of the Ear; the Anatomy of the Nose, Accessory Sinuses, Pharynx and Larynx; the Physiology of Respiration; the Physiology of Voice; the Physiology of Articulation; methods of Recording and Analyzing Speech Grafs; the development of the Child's Voice; General Methods of Examination in Speech Defects; Deaf-Mutism and Speech Disturbances in the Hard of Hearing; Mutism; Aphasia; Stammering; Stuttering; the Hygiene of the Voice in Song and Speech; Disturbances in Phonation; Symptomatic Speech Defects; Speech Defects in Neuralgia.

The author draws for his subject-matter on a wide experience in his own clinics in Vienna, and this volume should be of much service to all workers in these problems. M. A. G.

Anaphylaxis. By Maurice Vernet. Paris: Le Press Universitaires de France.

The title of this monograph expresses its subject-matter, namely, Sensibilisation, Anaphylaxis, Asthma and Spasmodic Coryzas; their pathogeny and treatment. Beginning with a critical exposition of the complications of spasmodic asthma and coryza of the anaphylaxis, the author continues with an interesting description of the sympathetic nervous system and the role of pneumogastric, concluding in Chapter IV with two excellent color plates of the nerve distribution.

Then follow chapters on treatment, with such therapeutic measures as Desensibilization, both specific and non-specific; thé administration of fractional doses; Jaborandi as a specific. The dose of Jaborandi to be dispensed varies according to the intensity of the affection to be treated and according to age. The author used an etheriol hydro-alcoholic extract of Jaborandi, known as Neopancarpine, and claims remarkable results not only in the treatment of affections that are included in this monograph, but in all anaphylactic conditions related to these neuro-arthritic affections, urticaria and probably some eczematous dermatoses. M. A. G.

Diseases of the Ear, Nose and Throat. By Gavin Young, M. C., Ch. B., F. R. F. P. S. Edinburgh: E. & S. Livingstone. Price, 1s. 6d.

The American profession calls these little volumes Quiz Compends; the British profession terms them, with dignity, Catechism Series. The 68 page pamphlet here presented is a brief Quiz Compend of diseases of the ear, nose and throat. M. A. G.